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PART I.

NORTH AMERICAN FORESTRY.

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[Abstract of lecture read January 27, 1914; the Hon. J. H. TURNER in the Chair.]

THE various aspects of American Forestry form much too large a subject to be even cursorily glanced at within the limits of an hour, so that it is proposed to discuss briefly the more important individual trees of the United States and Canada.

The White Pine (*Pinus Strobus*) was at one time the most important single timber tree in North America, but it has been so extensively exploited that now it only takes the third place in the list of United States timber exports. It has a very wide distribution east of the Rocky Mountains, extending from northern Ontario through the St. Lawrence basin, and southwards through the Alleghany and Appalachian Mountains to Tennessee and Georgia, where, in fact, some of the largest White Pines still standing are to be found. In Europe this species has been fairly extensively grown during the past century, but unfortunately its continued existence is seriously threatened by the fungus *Peridermium Strobi*, which causes the Blister Rust of the stem of this tree. Until 1909 this disease was unknown in North America, but on account of the large import of young Pines that was taking place from European nurseries the disease got across the Atlantic, and showed itself in several districts in the United States, necessitating very drastic methods for its eradication. Whether these will be successful or not is extremely doubtful, but if the Americans and Canadians had rested satisfied with raising nursery stock from their own seed, the probability is that the North American continent would have remained free from

this very serious trouble. All through Eastern Canada, and a considerable part of the Eastern United States, one meets with the Jack Pine (*Pinus Banksiana*), whose distribution extends northwards, almost to the borders of Alaska. It rarely forms a large tree, the bulk of the specimens one sees being no more than a foot or so in diameter; but it is easily satisfied and furnishes a large quantity of useful timber, which is employed for telegraph poles, railway sleepers, and similar purposes. Ten or twelve years ago German foresters planted this species on a considerable scale on the poorest class of forest soils, and although under these conditions it grows rapidly it has failed to fulfil expectations, and the probability is that one will not hear a great deal of it in future. Over a great part of Eastern Canada and the United States the Red, White, and Black Spruces are much in evidence, and furnish most of the wood that supplies the numerous pulp mills.

When one gets beyond Winnipeg, going westwards, forests in the strict sense of the term are unknown, the trees that are scattered over the prairie region being largely confined to the river valleys. Recognizing, however, the advantages of shelter to homesteads on the bare prairies, the Agricultural Department of Canada has during recent years done much to stimulate the creation of shelter-belts, for this purpose supplying trees free of charge, or at a merely nominal rate. One of the most important of the Government Nurseries is situated at Indian Head, which was practically a treeless area in 1905, but so well have the trees grown that now fine healthy plantations are to be seen round that centre. The trees that give the best results on the prairies are Scots Pine, European Larch, Norway Spruce, and Box Elder (*Acer Negundo*), and it is worthy of remark that Dr. SAUNDERS, who was for long the head of the Agricultural Experimental work of Canada, gives it as his opinion that no Canadian two-leaved Pine grows so well in Canada as the Scots Pine, no Larch so well as the European Larch, nor any Spruce so satisfactorily as the Norway Spruce.

When one gets into the foot-hills of the Rocky Mountains one comes across great numbers of Lodge Pole Pine (*Pinus contorta* var. *Murrayana*), a tree very similar in character to *Pinus Banksiana*, and used for much the same purposes. In the Rocky Mountains themselves one sees more of *Picea Engelmanni* than any other tree, this species being much in evidence in the Yoho Valley, all down the Kicking Horse Pass, round Lake Louise, &c. It grows with a fine, tall, straight stem, and very short branches, and is altogether of attractive habit, but apparently of little use for planting in Europe. As one travels in the Rocky Mountains one sees many long bare strips resembling "rides" running straight up the mountain-side. These are the lines down which avalanches descend every summer, and on which young trees are thus prevented establishing themselves. High up above Lake Louise, in the neighbourhood of Lake Agnes, one encounters *Larix Lyallii*, a rather dwarf Larch of little economic value.

It does not descend below something like 4000 feet, seldom even so low as this, the Larch that one meets with in Eastern Canada at low elevations being *Larix microcarpa* (= *americana*), a tree which never attains to a large size, though it furnishes in the aggregate a great quantity of useful timber. As this Larch grows better on marshy land than almost any other Conifer, it is possible that it might be of some value in Britain for planting on bog land.

The western slope of the Rocky Mountains and the Selkirk Ranges do not contain many members of the genus *Pinus*, but a fairly common one is *P. monticola*, a near relative of the Weymouth Pine, and in Europe suffering even more from *Peridermium Strobi*. At high altitudes one meets with *P. flexilis* and *P. albicaulis*, which are little more than bushes near the timber line, and in no case reach large dimensions. Among the commonest trees on the western side of the Rockies is the Western Hemlock (*Tsuga heterophylla* = *Albertiana*) and its near relative *Tsuga Mertensiana* (= *Pattoniana*). The former is one of the most graceful of Conifers, and makes excellent growth in many parts of the British Isles, where, as in its native habitat, it reproduces itself very freely from self-sown seed. The timber, however, is not of high quality, being in this respect surpassed by both Spruce and Pine.

A tree everywhere in evidence as one gets westwards from the Rocky Mountains watershed is the so-called Red Cedar (*Thuja plicata* = *gigantea*), which sometimes attains to gigantic proportions, as in the specimens—some growing, some dead—in Stanley Park, close to Vancouver City. This tree grows well in the British Isles, where, however, there is not likely to be much demand for Red Cedar timber for the particular purpose for which it is most used in America, namely, the manufacture of roofing shingles. In the eastern part of Canada roofing material is furnished by *Thuja occidentalis*, but in the west it is *Thuja plicata* which furnishes this particular building requirement, and it is not too much to say that almost all the houses on the Pacific slope are rendered rainproof by means of this timber. Not only so, but great quantities are sent eastwards to be used in the prairie cities of Calgary, Edmonton, Moose Jaw, Medicine Hat, and Winnipeg.

At no great distance from the Pacific coast one finds the Sitka Spruce, a tree that is rapidly growing in favour for afforestation purposes in Britain, where in time it is not unlikely to supplant the Norway Spruce. But the tree which is by far the most important on the Canadian Pacific slopes, and for the matter of that in many parts of the west of the United States also, is the Douglas Fir, which is yearly commanding an increasing amount of attention from lumbermen. This species covers enormous areas in the Selkirks and on Vancouver Island, spreading northwards into the Yukon and southwards through a large part of the Western United States as far south as Mexico. The quantity of timber growing on an acre often runs to an enormous volume, but it would not appear that the Douglas Fir

grows more quickly in its native home than it does in the British Isles ; in fact, I have seen better growth in young trees both in England and Scotland than I have found in Western Canada. Comparatively little Douglas Fir timber finds its way to European markets, the voyage round Cape Horn being the chief deterrent. But with the opening of the Panama Canal, Europe may reasonably expect to receive largely enhanced supplies. At the present time the bulk of this timber is exported to China, Japan, Australia, and the Cape. By universal consent the Douglas Fir is regarded as the most valuable of all the additions that have been made to the number of exotic trees growing in Britain. It is practically free from disease, is easily satisfied as regards the situation, provided the soil does not contain too much lime and the situation is not too much exposed to gales, and it furnishes a product almost as durable as Larch and in much larger volume for a given area, an annual growth of 200 cubic feet being quite common for this species, as compared with about one-fourth for the other important Conifers.

South of the Canadian boundary with the United States one encounters such well-known trees as *Wellingtonia gigantea*, *Sequoia sempervirens*, *Abies nobilis*, *Pinus Lambertiana*, *Pinus ponderosa*, and several other species more or less well known in parks and pleasure grounds in this country. The American Western Larch (*Larix occidentalis*) spreads to some extent north of the international frontier, but its distribution is for the most part in the north-western United States, where it produces stems up to 250 feet high, and furnishes very valuable timber, which, however, is rather inaccessible as regards situation. Some expectation was recently excited in this country that Western Larch might prove a valuable addition to our list of timber trees, and although it is possible that under certain circumstances it may be proving satisfactory, others are known where the results are not favourable.

No one can travel through Canada and the Northern United States without being impressed with the enormous destruction that has resulted to forests through fire. Estimates have been made of the annual destruction, but the figures furnished can be little better than a rough estimate. However, the fact is patent to anyone that the first duty of the Canadian and United States Governments is to control forest fires, and this is now being very seriously taken in hand by means of regulations concerning the lighting of fires by tourists and others, and particularly in regard to disposing of the brushwood that is left by the lumbermen, which is a frequent cause of the origin of a conflagration.

While the north-west of America is most impressive for its wealth of Conifers, one has to go to the south-east of the United States in order to realize what the North American continent can produce in the way of hardwood timber. The two mountain ranges of the Alleghanies and Appalachians that run roughly parallel with the Atlantic seaboard, were at one time largely covered with hardwood

trees, though what remains of the virgin forests is now comparatively only a remnant.

Four years ago I spent some time inspecting these forests in the Great Smoky Mountains near the frontier of the States of North Carolina and Tennessee. The principal species of tree in that region is the Tulip tree, *Liriodendron tulipifera*, which produces the lumber known on the American market as Yellow Poplar. It is a tree that attains to large proportions, reaching a girth in some cases up to 25 feet, and I myself measured many of 15 feet. There one also meets with a great number of species of Oak, whose identity in the winter season I was not able to determine, and with these are intermixed Chestnut (*Castanea dentata*), Beech (*Fagus americana*) and species of Hickory, Ash, Lime, Horse Chestnut, with a thin sprinkling of Black Cherry (*Prunus serotina*). The last tree attains to a height of over 100 feet, but its maximum girth seems to be about 8 feet; it is abundant nowhere, and is getting scarcer. At the present time it is one of the most valuable timbers on the American market, being equalled only by Black Walnut and Pencil Cedar (*Juniperus virginiana*). The condition of things in the south-east of the United States as regards forest fires is very different from that which prevails in the coniferous forests of the Northern United States and Canada. In a hardwood country, forest fire, if it occurs at all, takes the form of a low, harmless burning of the dead leaves lying on the surface of the ground, stems being practically unaffected, even seedlings no more than an inch or two in thickness being hardly affected. Of course fire may smoulder for days in an old fallen stem or even in the decayed centre of a standing tree, but, on the whole, the damage is practically negligible. Things assume a worse aspect, however, when fire follows lumbering operations, because then the ground is covered with what the Americans call "slash," that is "top and lop," and as this material burns readily, a fire running over such ground will destroy all the smaller class of trees that the lumbermen have thought fit to leave standing.

Although hardwoods are by far the most important feature of south-eastern American forests, there is a certain number of Conifers, and, in fact, even in the extreme south of the Appalachians, where they terminate on the borders of Georgia and Alabama, one finds some of the finest White Pine that now remains on the American continent. In the same region, especially on north slopes, are to be found considerable groves of Canadian Hemlock, which there appears to attain to its maximum size (120 feet high and 15 feet in girth), although practically on the outside fringe of its southern geographical distribution. The tops of the highest hills in the Appalachians are either bare of trees—a rare condition of things—or are covered with pure stands of *Abies Fraseri*, which, like all the Silver Firs, is in America popularly called Balsam. In the same district one occasionally comes across *Tsuga caroliniana*, a tree of no economic importance. The Conifers just mentioned, with here and there specimens of *Pinus Taeda* and

Pinus rigida, constitute practically all the coniferous timber of that district, although in the swampy plains a little further south one finds great areas covered with Pitch Pine and Deciduous Cypress. An attractive feature of the forests of the mountains of the south-east United States is the undergrowth of *Rhododendron* and *Kalmia*; but I was not fortunate enough to see them in flower.

ON THE USE OF EXPLOSIVES AND OF THE BLOW-LAMP
IN THE GARDEN.

By HERBERT E. DURHAM, Sc.D., M.B., B.C., F.R.C.S.

[Read Feb. 24, 1914; Sir ALBERT K. ROLLIT, LL.D., in the Chair.]

EXPLOSIVES.

AFTER having been somewhat concerned in trials of explosives for agricultural purposes on the large scale, through my friend Mr. HAROLD BARNETT, the pioneer in Herefordshire (in November 1912), the thought came to me, why not try these agents on a small scale on my garden? And the thought became more fixed from the circumstance that, though my garden has been under cultivation for some fifty or sixty years, the surface has apparently never been dug more than two spits deep; moreover, the amount of labour and time needed to trench a patch three full spits deep was considerable—of the former because the subsoil consists of a stiffish clay containing large stones, which necessitated the use of the fork before it could be turned with the spade, and of the latter because, through weather conditions, some two months elapsed ere a piece ten by eighteen yards in extent could be completed.

I do not propose to detail the history of the procedure, which was, I believe, first used in the United States of America for subsoiling, ditch-making and tree-planting. The blowing up of tree stumps is a comparatively old and well-known use for explosives.

It may be objected that my own experiments are on too small a scale and too recently instituted for making generalizations at the present time; still the record of the first season's results may be of sufficient interest to justify their publication.

The leading idea in their use is, of course, to crack and fissure the subsoil so as to allow air to enter, and water to percolate, especially where, from the effects of weather and cultivation, an impervious layer of clay or silt, known as a pan or hard pan, has been developed; that is to say, to promote the aeration and drainage of the subsoil, more deeply and with less expenditure of labour and time than is feasible with the spade. It has also been suggested that the nitrous fumes might have some manurial value of themselves and cause some destruction of soil pests. With regard to the latter, I may note here that some Witloof Chicory roots which had been heeled in right over the site of subsequent explosions, were found to be infested with live slugs a fortnight later; the fumes from the explosive had been seen issuing from amongst the roots, so that, so far as concerns slugs, no effect was produced.

For quick preparation of the ground for tree-planting, the use

of explosives seems to be an almost perfect plan ; but it remains to be seen whether trees planted by this method do so very much better than those on spade-dug ground, as has been asserted in the United States of America.

The question as to the time of year the explosive should be used must remain unanswered until more experience has been obtained. If we had the gift of accurate prophecy of the weather during the winter and early spring months, I am inclined to think that early in the winter would be the best time for comparatively light soils and later for heavier ones, especially in a wet season. But, generally speaking, probably February is the most favourable time, so that if wet weather should tend to clog the seed-beds they may be well drained at any rate during the first season.

The mode of manipulation is a simpler matter to deal with, at any rate as regards the actual application of the charges ; but their size and their distribution probably require further experience before the most efficient mode of use can be said to have been determined.

Besides cartridges, detonators, and fuse, the apparatus required consists of a pointed bar (about $1\frac{1}{4}$ inch diameter and about $4\frac{1}{2}$ feet long), with which to make the holes ; a heavy hammer, with which to drive the bar ; a straight wooden stick about an inch in diameter and cut square at the end, with which to stem and tamp the holes ; a pair of sharp sécateurs, with which to cut the fuse with clean straight ends ; and a small pair of gas pliers, with which to nip the detonators tight on the fuse. Fuse and detonators are not required if cartridges fitted with electric ignition are used, but their extra expense probably hardly covers the advantage of simultaneous discharge of a number of shots.

Each cartridge has to be prepared at the time of use with fuse and detonator. First the end of the fuse is freshened with a clean square cut, for fear that the end of the core may have been deteriorated with exposure in storing ; next the detonator is carefully emptied of the packing sawdust by a few jolts, and gently pushed home on the end of the fuse ; with the gas pliers the edge of the copper is slightly nipped, so as to hold the detonator firmly on the fuse. Of course care will be taken not to pinch the charged end. Thus prepared, the detonator is pushed into the substance of the cartridge, in which it may be necessary to make a hole with a pointed piece of stick (this is always the case if solid explosives, such as gelignite, are used ; these, through having nitroglycerin in them, are dangerous to use in frosty weather). The paper case is now tied with twine to secure it on the fuse. The charge is now ready to be placed in the hole. The holes are made vertically downward, and should be quite three feet deep. From what I have seen of shallower holes, I venture to think that three feet is the minimum depth to be advised, and that in reckoning the depth allowance should be made for the distance to which cultivation has loosened the topsoil. Thus, if the soil is fairly loose for a depth of a foot, it might be reckoned as only half that amount, and the hole made to 3 feet 6 inches from the surface.

One piece of my ground had recently been double-dug before the exploding, and it was obvious that much of the force was wasted.

Just as with digging, exploding should not be done when the soil is soppy and waterlogged; frost does not matter much provided a safe, i.e. frost-proof, explosive is used. For good work it is essential that no air-space should be left around or below the cartridge; now the end of the hole is a mould of the pointed end of the bar, and unless this is filled, the explosion is liable to cause the formation of a cavity under the surface, and so loss of power which should have been applied to the solid ground. Consequently, before the cartridge is lowered into place, the pointed end of the hole should be filled with fine, dry, sifted earth. In the later explosions in my garden, I filled the ends of the holes with ground lime, and put some also above the cartridge, with the secondary intention of breaking up the clayey subsoil more permanently. This lime lies very close, and makes an excellent bed for the cartridges, but whether it becomes sufficiently disseminated to be of real use I do not know.*

The cartridge having been lowered into place, more fine soil is poured in, and gently rammed down with the stemming stick; thereafter the rest of the hole is filled with earth and well rammed down after each addition. The end of the fuse, which should have been cut so that about an inch or two projects above the ground level, may again be freshened if the weather is moist, and then lighted, most conveniently by an ordinary fusee. It may be noted that the explosions are by no means spectacular or noisy, and that no pieces of earth should be projected into the air. It is probably advantageous to explode a number of holes simultaneously, but this is hardly practicable unless high-speed fuse or electric ignition is used.

After the results of this trial shot have been noted, the work may be continued. It is preferable to plan out the sites of the holes, and have them made in advance, so that there may be no waiting. Should they become waterlogged, the junction of cartridge case and fuse must be coated with grease.

We now come to the consideration of the size of the charges, and the distances of the holes apart. This is closely related to the question of cost, the object being to get the optimum effect with the least expenditure; it is further tempered by the nature of the subsoil. I am given to understand that with the explosive "cheddite" a 4 oz. cartridge of $1\frac{1}{2}$ in. diameter, which is fired at a depth of 3 feet and 10 feet from the next, gives a loosening effect in clay soil to a depth of $4\frac{1}{2}$ feet, and affects a circle of radius about 5 feet ($=8\frac{1}{2}$ square yards). In the soil of a garden which has a good tilth for about 18 inches, the loose character of the upper layers will no doubt lead to a smaller working effect.

* It would be interesting to determine how far such substances are driven into the soil, as could easily be done by using a lithium or strontium compound, and examining portions taken with a sampling tool at different distances by means of the spectroscope.

In the open and on the large scale, it is, of course, possible to use large charges, but in an enclosed garden in the neighbourhood of walls, glasshouses, &c., I was advised not to exceed charges of about two ounces from fear that foundations, &c., might be unduly disturbed.

The trials that I have made were therefore designed to ascertain what effect would be produced by small charges at a depth of three feet, and I am much indebted to Mr. W. D. GIBBON for his advice and assistance. Accordingly, patches were treated with 2 oz., 1½ oz., 1 oz., and ½ oz. charges placed three feet apart. This was admittedly an extravagant distribution, but the idea was to try what might be called the intensive plan; for, in giving a thorough opportunity to the explosive, a small area in a garden may be treated at a rate which would be absolutely prohibitive in cost when applied to the treatment of whole acres. Roughly speaking, the cost of fuse and detonator may be put at about 1½d. and the powder at 1d. an ounce at retail prices; so that on the estimate of the working effect of a 4 oz. cartridge, which has been given above, a ten-foot circle is worked for less than sixpence. At wholesale prices the cost would be considerably lessened, for an ounce is estimated at about ¾d., and including fuse and detonators some four or five 2 oz. shots can be had for a shilling. At a cost of £8 an acre, somewhere about 700 1 oz., 500 2 oz., or 330 4 oz. shots would be available.

With regard to the energy developed by cheddite, I am informed that, allowing 50 per cent. loss of the total available energy, a 2 oz. charge gives about 50,400 foot-pounds in the soil. If we contrast this with the work put into the soil by the spade, taking the weight of soil at 90 lb. the cubic foot and supposing each spadeful is raised 2 feet in the process of digging and breaking up a cubic yard, then energy put into the soil would be 4860 foot-pounds, of course not including the waste energy dispersed in lifting the spade itself. Thus, where 2 oz. charges were used a yard apart in my garden, quite ten times as much energy was put into the soil as the use of the spade to a depth of only 3 feet would have done.

Results with Potatoes.—One bed was planted with maincrop potatoes so that part of each row was on ground which had received different treatment. The plot had had a dressing of stable manure with some artificials the previous season, and a liming in the winter. No further manure was given, partly to see what effect the extra deep cultivation alone would do, and partly to avoid possible errors from unequal distribution. The rows were 28 inches apart, and the tubers put in 18 to 20 inches from each other. The varieties were 'Sutton's Reliance,' 'Crimson Beauty,' and 'Golden Perfection.' The last ('Golden Perfection') may be dismissed at once, for the growth and crop were too irregular to be worth consideration; it may be added that the seed tubers were home saved, and that many of them failed to undergo the natural process of autodigestion and were still quite

hard when dug up in the autumn. It would be interesting to know whether this failure, which I understand was not uncommon last season, was due to directly defective formation of ferment or to want of a "hormone" secretion, if indeed these peculiar substances exist in the vegetable world.*

The failure of this variety is the more to be regretted in the light of the differences between the crops of the other two varieties.

Table I. shows a detailed plan of the trial patch with the numbers of plants, weights, &c., and in Table II. the results are given in percentage form. It will be seen that there is a certain variation in the yields of individual rows, and this is particularly obvious in the rows R and S; here evidently the soil was more fertile, no doubt from having been the site of a celery trench, nevertheless it was affected by the explosive. The continued wet weather of the earlier part of the year was followed by drought from about May 10. On August 3 it was noted that the six rows of 'Reliance' (A, B, C, F, G, and H) on the 2 oz. treated ground showed marked yellowing of the leaves, but none of the other plants gave any sign of flagging. It might be thought that the capillarity of the ground had been unduly upset, and it is perhaps interesting to note that this patch was not tamped with lime, which, however, was done on all the rest of the exploded ground ($1\frac{1}{2}$, 1, and $\frac{1}{2}$ oz.).

'Reliance' responded better to the smaller charges of explosive, viz. 1 oz. and $\frac{1}{2}$ oz., both of which gave an increased yield of more than 18 per cent., whilst 2 and $1\frac{1}{2}$ oz. only gave about 8 per cent. and 4 per cent. respectively. It will also be seen that the average weight of the larger tubers (excepting rows R and S) was rather greater on the unexploded land. With regard to the figures relating to small tubers, it should be pointed out that a considerable proportion of the small sizes was due to secondary growth, though some was to be ascribed to "original sin" of the plants; it seemed hardly practicable to separate these from one another.

So far as the experiment goes, the more moderate charges are best suited to this variety.

With regard to 'Crimson Beauty,' we see that the response to the explosive is very well marked, and notwithstanding the fewness of the rows the results acquire value through the yields being graduated concordantly with the doses of explosive. Thus, omitting row Q, which is in proximity to the aberrant rows R and S, we find that the $\frac{1}{2}$ oz. charges gave about 15 per cent. increase, the 1 oz. 43 per cent. and the 2 oz. about 88 per cent. Row Q works out at 41 per cent.,

* "Hormones" (STARLING and BAYLISS) are substances which are secreted in one part of the animal economy, and stimulate secretion of certain specifically affected but remote glands. In the botanical world there seems to be a tendency to misuse this term, and even to make it include foreign substances; for instance, RUSSELL ("Soil Conditions and Plant Growth," 1913) quotes that ammonia, toluene, ether, and chloroform are highly effective hormones. It is very regrettable that a new word in biology should be so soon divorced from its proper meaning.

increase in favour of the explosive. These results seem to indicate clearly that trials of a large number of well-marked varieties with

TABLE I.—POTATOS.

2 oz. Explosive 3 ft. apart. EARTH TAMPED.	Row.	Variety.	No. of Plts.	Weight of Crop.		No. of Plts.	Weight of Crop.		No Explosive.
				Large and medium.	Small.		Large and medium.	Small.	
	A	Reliance	9	lb. oz. 26 6	lb. oz. 0 6	7	lb. oz. 21 3	lb. oz. 0 4	
	B	Reliance	10	24 2	1 7	8	20 0	0 4	
	C	Reliance	9	27 9	3 8	7	21 5	0 9	
	D	Gold. Perfect.	6	2 12	not weighed	7	3 7	not weighed	
	E	Crimson Beauty	9	26 2	0 11	7	12 10	1 11	
	F	Reliance	10	35 0	1 11	7	19 9	1 2	
	G	Reliance	10	24 14	0 14	7	18 0	1 13	
	H	Reliance	10	34 12	2 2	7	19 3	1 11	
1 oz. Explosive at 3 ft. apart. LIME TAMPED.	I	Gold. Perfect.	8	5 12	not weighed	8	0 14	—	
	J	Reliance	9	30 11	3 10	7	27 7	1 4	
	K	Reliance	10	29 12	1 4	7	16 0	1 1	
	L	Reliance	9	30 7	0 15	7	22 15	3 5	
	M	C. Beauty	9	14 3	1 10	7	15 3	0 12	
1 1/2 oz. Explosive 3 ft. apart. LIME TAMPED.	N	G. Perfect.	—	—	—	—	—	—	
	ASPARAGUS.								
	N ← ————— (S)								
	O	G. Perfect.	10	6 12	—	7	—	8 5	No Explosive.
	P	G. Perfect.	—	—	—	—	—	—	
Q	C. Beauty	10	28 5	3 8	7	15 2	1 0		
R	Reliance	10	41 14	4 1	7	34 2	2 13		
S	Reliance	10	53 2	7 5	7	32 0	3 10		

varying doses of explosive would give important data. The effect of tamping, with and without lime, is also possibly worthy of trial on a more extended scale.

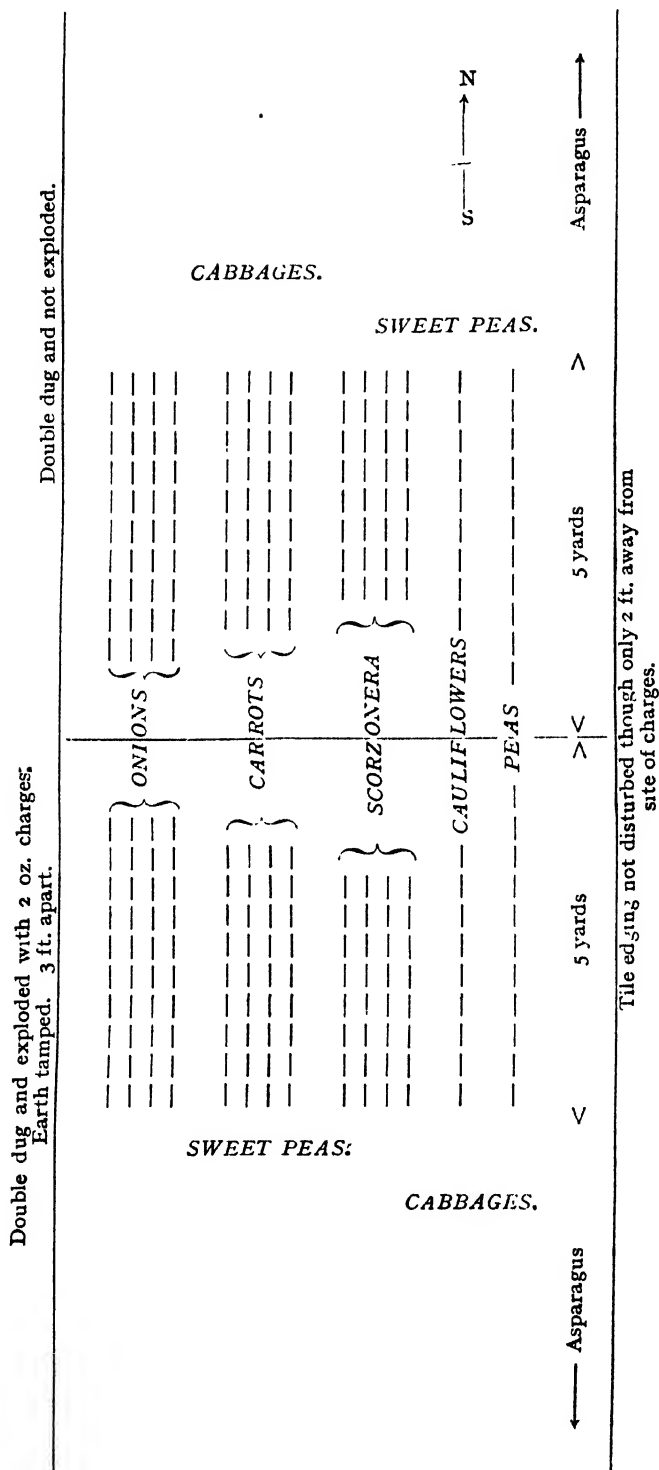
Other Crops.—The disposition of the crops is given diagrammatically on the plan below. The plot which was available for general

TABLE II.

Variety	'RELIANCE.'		'CRIMSON BEAUTY.'	
	2 oz. Explosive.	No Explosive.	2 oz. Explosive.	No Explosive.
Crop per 100 plants :—				
Larger tubers . . .	297 72 lb.	277 33 lb.	279 1 lb.	137 5 lb.
Small „ . . .	17 24 „	13 23 „	7 6 „	15 2 „
Total . . .	314 97 „	290 56 „	286 7 „	152 7 „
Number of larger tubers	1306 5	1036 3	—	—
Weight of 100 „ „	19 9 lb.	27 5 lb.	—	—
	$\frac{1}{2}$ oz. Explosive.	1 oz. Explosive.	$\frac{1}{2}$ oz. Explosive.	1 oz. Explosive.
Larger tubers . . .	324 33 lb.	316 07 lb	157 6 lb	216 9 lb.
Small „ . . .	20 76 „	26 78 „	18 0 „	10 9 „
Total . . .	345 09 „	342 86 „	175 6 „	227 8 „
Number of larger tubers	1307 1	1242 6	—	—
Weight of 100 „ „	24 8 lb	25 43 lb	—	—
	$1\frac{1}{2}$ oz. Explosive.	No Explosive	$1\frac{1}{2}$ oz. Explosive.	No Explosive.
Larger tubers . . .	475 0 lb	472 2 lb.	289 3 lb.	216 1 lb.
Small „ . . .	56 87 „	38 8 „	35 0 „	14 3 „
Total . . .	531 87 „	511 15 „	324 4 „	230 4 „
Number of larger tubers	1555	1857	—	—
Weight of 100 „ „	30 5 lb.	25 4 lb.	—	—
Crop on NON-EXPLODED ground reckoned as 100.				
	'Reliance.'		'Crimson Beauty.'	
No explosive : 2 oz. = 100 : 108 6 lb.			= 100 : 188 lb.	
„ 1 oz. = 100 : 118 2 „			= 100 : 143 „	
„ $\frac{1}{2}$ oz. = 100 : 118 9 „			= 100 : 115 5 „	
„ $1\frac{1}{2}$ oz. = 100 : 104 07 „			= 100 : 141 „	

crops did not give quite a fair chance to the explosive, for it had been recently double dug all over before the idea of exploding had been

TABLE III.—PLAN OF TRIAL OF GENERAL CROPS.



formed ; and this amount of cultivation was largely sufficient in itself, and undoubtedly masked the full effect of the explosive by loss of power through the loose soil ; thus, whilst the cartridges were placed nominally 3 feet below the surface, in fact they were only about 18 inches deep in firm ground. Nevertheless there are some points of interest to record. As with the potato patch, beyond liming no manure was given, with the exception of liquid manure to the cauliflowers, nitrate to the peas shortly before picking, for flavour ; also, owing to the prevalence of root aphid, a few waterings with sulphocarbonate were given to the carrots. Owing to the prolonged drought, a few soakings with the hose were given as well as surface stirring with the "serfouette," a tool which to my mind is often preferable to the ordinary hoe.

The cauliflowers and cabbages showed no tangible differences in size or dates of maturation on exploded and non-exploded ground. Actually the largest cauliflower was gathered on the exploded ground, but this is hardly worthy of comment.

With regard to sown crops (peas, carrots, onions, and scorzonera), the size of the crop was determined by the germination of the seeds, or, perhaps, rather more correctly, by the survival of the seedlings, for the seeds germinated well in general. The rows were planted five yards on either side of the limit dividing the exploded from the non-exploded ground.

Peas.—'King Edward.' Only about a dozen plants survived from the first sowing on the unexploded side ; the second sowing came up better. It was noted that both sowings blossomed and matured about a week earlier on the unexploded ground. The same occurred with a few pot-raised sweet peas which were planted out.

Carrots.—'Scarlet' and 'Yellow Intermediate.' The germination was so poor on the non-exploded ground that no thinning out was done. Those on the exploded ground were subjected to thinning out and gave 165 pieces as against 130 on the non-exploded. Average weight on exploded ground 3·3 oz., on non-exploded 3·4 oz.—a difference which is probably accountable to the relative sparseness of the plants.

Onions.—'Sutton's Ari' and 'Ryder's Exhibition.' As with the carrots, the germination was very poor on the non-exploded ground, and no thinning out was done. Those on exploded ground were thinned, and gave 90 pieces as against 70 on the unexploded. The average weights were 2·51 oz. and 2·55 oz. respectively.

Scorzonera.—'Heinemann's One Year.' This was chosen as a good deep-rooted plant, and preferable to the more commonly grown salsify, which, I think, is not worth cultivating. Here the difference in germination was yet more marked, for two rows only gave two plants on the non-exploded, three about the border line, and twelve on the exploded side. Taking those on the border as having been influenced by the subsoiling, the crop was about sevenfold in favour of the explosive. A second late sowing was a failure, no doubt owing to the drought.

In all these cases there is concordant evidence that the effect of the explosions on the seed-bed was good; the ground, although double dug, became badly clogged where it had not been exploded, and later in the dry period exhibited a few cracks. The drainage was insufficient to allow the young seedlings to prosper. The effect on drainage was also seen on the potato patch, where during the rains the water stood in puddles on the unexploded land.

Asparagus.—The effect of draining and clogging was very well demonstrated by the growth of some asparagus seedlings. These were planted out partly on exploded and partly on non-exploded ground, otherwise the soil treatment for each lot was identical. The difference in growth was soon patent to the eye; on June 7 the shoots were measured, when it was found that the growth on 100 plants amounted to 842 inches (70 feet) on the unexploded part, whilst it was 1485 inches (nearly 124 feet) on the exploded part. That is to say, the luxuriance of growth was not very far from having been doubled. It will be interesting to note whether the difference will be maintained during the coming season.

Summary.—It is evident that in all cases a beneficial effect was produced by the explosive treatment, the cropping of 'Crimson Beauty' potato, the effect on the seed-bed, and the luxuriance of the asparagus seedlings being especially noteworthy.

Whilst the best method of application of explosives is still far beyond the realms of dogmatic statement, I am inclined to think that comparatively small charges,* deeply placed, are likely to be best suited to the purposes of the garden. It may be noted that the use of explosives gives a means of subsoiling old borders, &c., without removing the plants. I propose to try the effect of 1 oz. or 2 oz. charges on part of an herbaceous border and also on an old asparagus bed without otherwise disturbing the plants; similar treatment is already being tried on some young orchard trees which have not been doing well.

THE PLUMBER'S BLOW-LAMP AS A GARDEN TOOL.

It is now eight years since I first introduced the blow-lamp to my garden, and its range of usefulness is such that I venture to think that others may like to employ it. Last year its use was recommended in France as a means of attacking the woolly aphis (*Schizoneura lanigera*), but the purpose for which I particularly recommend it is the destruction of weeds. Incidentally I have also used it for destroying pests on a small scale; thus, at night, slugs are apt to take an airing on tile or brick edgings, where they make themselves amenable to the use of the lamp; ants' nests may also be destroyed if in suitable situations, and occasionally I have been able to kill considerable numbers of the "turnip fly" between rows of seedlings. Moreover, pests such as the raspberry weevil, which fall to the ground

* E.g., 1½ to 2 oz. cheddite, 3½ to 3½ ft. deep, and 2 to 2½ yards apart.

when disturbed, might also be attacked by this means. In such chases by night, a good light, such as that of an acetylene bicycle lamp, is a great aid.

For the destruction of weeds in a rapid and effectual manner, they should be attacked whilst in seed-leaf, or at any rate, whilst still quite small. At such time, the very slight scorching entailed by a rapid passage of the flame is sufficient to determine their destruction. When, however, they have grown large and the root system is well established, they are more suitable for eradication by old-fangled methods; still even then with the aid of a hooked and pointed iron rod their roots, which are very sensitive to the flame, may be put *hors de combat*. Again, when they are in the seeding state, the lamp may be effectively employed to prevent the seeds from spreading, at a time when the ordinary hoeing and raking beget a somewhat Sisypheus-like employment. There are also situations where it is inexpedient or too risky to employ weed-killer, and here again the lamp may be useful.

Hitherto I have chiefly used the small one-pint size "Aetna," which gives a flame about 9 inches long and burns for about an hour, in which time a considerable amount of ground may be treated. For working amongst young growing crops, a small lamp of this description is good, for one can work fairly close without risk of damage. Where there is plenty of room, a larger and more powerful lamp may be employed.* Thus, last October, I borrowed a full-sized brazing lamp from a plumber, and, for an experiment, had my front drive treated with it to see how long the green algal growth would be kept in abeyance. Now, mid-February, the green is just beginning to reappear in places, but a few scattered grass seedlings have not reappeared.

The best and most rapid work is done when the ground is fairly dry, and the day is calm. Naturally, seeds on the surface which are about to germinate are liable to suffer the fate of the visible seedlings. Some six years ago, in order to get an idea of the working effect of the lamp, I treated the alleys between rows of raspberries in a very weedy garden. One alley was left untreated, a second was lamped once, a third twice and the fourth thrice, with intervals of a week or ten days between the lampings. The untreated row became a veritable jungle of weeds; the once-lamped alley showed a good many weeds, but with void spaces; the twice-lamped alley only produced about a dozen or so scattered weeds, whilst the thrice-treated one was clear, except for a couple of groundsel plants close to the canes, in the whole ten-yard length.

With the ordinary hoeing, unless a spell of dry weather occurs, a considerable proportion of the disturbed seedlings are apt to take root again, when again the hoe must be brought forth. With the

* The lamp exhibited at the lecture was a No. 5 "Tarantella," burning paraffin and giving a 14 in. flame: on trial it seems to be a suitable and powerful lamp.

lamp, however, one can become a really veracious "weather" prophet and announce that there is to be a *very* warm time for the weeds. If the surface is slightly disturbed with the iron hook, whilst the lamp is being used, the permanence of effect is more marked than if the surface is untouched; moreover, any casual larger weed may be made to suffer. Lastly, the lamp may be used for soil sterilization, by heat, on a comparatively small scale. For this purpose a piece of pipe, such as 2½ or 3 inch spouting, preferably with a bend attached to the end, is buried in the soil, and the flame of the lamp directed into the pipe, at the other end of which a broken crock may be used as a damper. By moving or changing the soil with a trowel or a spade a considerable amount of soil may be heated without any elaborate preparation. In the coming season, I design treating some patches in the open for seed-beds, and a narrow border by a wall which has had two successive tomato crops upon it.

The blow-lamp has a considerable range of usefulness in the garden, first to destroy young weeds, second to prevent weeds from seeding, third to destroy some pests, fourth to sterilize soil by heat, and lastly to tidy up a green or weedy path at very short notice.

Notwithstanding the addition of explosives and blow-lamps to our gardening apparatus, I think that you will probably agree with me that we have not yet arrived at a sort of horticultural millennium when all the deep cultivation will be done with explosives, when the ordinary digging will be replaced by injections of carbon disulphide or toluene, when the surface weeding will be done with the blow-lamp, and specimens of the spade and the fork become some of the most valued antiques in a museum of a Royal Horticultural Society.

EVOLUTION BY DEGENERATION

OR ADAPTIVE DEGRADATIONS, THE CAUSE OF MANY CASES OF EVOLUTION AMONG PLANTS.

By Rev. Prof. G. HENSLow, M.A., V.M.H.

[Read March 10, 1914; Mr. C. R. FIELDER, V.M.H., in the Chair.]

Evolution, wrongly implying "Advance" only.—The popular idea of evolution would seem to be that it implies a general advance and improvement towards some unknown, perfect ideals in the structure of plants and animals. The converse, however, is often lost sight of; but the fact is that no animal or plant, which has altered its structure in some way, did so without incurring certain degrees of degradation or loss in another at the same time. It may not be always prominent, but in all cases the organism, in whatever degree its structure may be degraded, is always thereby more in harmony or adaptation to the conditions of life which brought about the degradations. Thus, the whale-bone whale, derived, no doubt, from some ancestral terrestrial quadruped, has now no teeth, except as rudiments in the embryonic condition of the animal. It, in all probability, had four legs and feet, but, in changing its habit of life in adaptation to water, the hind ones disappeared, leaving rudiments of the legs only below the surface of the body, while the forefeet are now represented by paddles adapted for swimming; and the "whale-bone" is a substitute for the teeth, for it is the best means of securing the minute organisms upon which the whale feeds.

So is it in plants. When stamens became altered, they lost the structure and function of anthers with pollen, and became attractive as honey-secreting organs.

The idea of progress associated with evolution is correct so far as fossil animals obeyed the law that the most ancient members of any particular group, when in the *adult* stage, more nearly resembled the embryonic or *young* stage of their later or modern representatives of the same group.

Thus the early amphibia were, like our newt, transitional forms between fishes with gills and land reptiles with lungs only; by their possessing both these organs they were the highest known animals of the Coal period. Their descendants in one line were frogs and toads, which are fish-like only when in the tadpole stage; but no true frogs and toads are known till a much later epoch.

The Meaning of Degradation and its Causes.—One speaks of degradations and degenerations in plants, but there is nothing

“derogatory” in the use of the terms. They only signify the disappearance more or less completely of certain parts with the alteration and development of others. The whole process is simply the result of self-adaptation to new conditions of life.

The new conditions may be of various kinds, such as an increase or decrease of water, alterations in the nature of the soil, a deficiency of light, as in woods, varying amounts of heat, as well as parasitism and saprophytism. Each of these factors may so affect the organism, when the seeds have germinated under new conditions, that unless they can adapt themselves to the *totality* of effects they must perish. Within limits all plants possess this power of responding adaptively to changes in their environment. Then, if they continue to live for several generations under the same conditions, the newly-acquired characters tend to, and usually do, become *relatively* if not *absolutely* fixed and hereditary.

Hence arise species with a few or more degenerate organs about them. Such degraded features are taken note of by systematic botanists, as “specific characters.” Thus, the name *depauperata* is not infrequently given as specific or varietal, suggesting the fact that starvation was the cause of the degenerate features.

The two most important factors which cause degeneration are excess and deficiency of water, as in aquatic plants and those of heaths and deserts respectively.

Examples of Aquatic Degradation.—Let us take as an example of the former the aquatic buttercup known as the Water-Crowfoot. We may safely assume that it has descended from some terrestrial species. It is familiar to all by its numerous little white flowers standing out of the water and its completely formed leaves floating on the surface, while the submerged leaves are finely dissected like fennel. Hence it has the name *Ranunculus heterophyllus*. Another species is still more degenerate, for it has no floating leaves at all, and is called the “hair-leaved,” *Ranunculus trichophyllus*. If a floating leaf of the former happen to have one half of it below the surface, that half always becomes dissected. Moreover, numerous other genera of various families, respectively, often have a species, or the family may have a whole genus, aquatic, while all the rest are terrestrial. When this is the case, all the aquatic ones, as a very general rule, have similar dissected leaves.

Hence we are justified in inferring that submergence, or rather the water, is responsible for the dissected type of foliage. To prove experimentally that the dissected type of leaf is the actual result of degradation through the effect of water, nutritive salts were dissolved in it; the consequence was that not only was the superfluous water within the plant discharged (which had so saturated the protoplasm that it was too weak to make a complete leaf), but as soon as it had absorbed the nourishment *perfectly formed leaves were subsequently developed under water*.

From this experiment we may generalize upon the deteriorating

effect of an excess of water upon all the parts of an aquatic plant which grow submerged.

If the seeds of the Water-Crowfoot be grown in a garden soil, or in the mud when a pond dries up, they all germinate and grow up into vigorous land-plants ; but the whole internal structure responds to aerial conditions and is developed in adaptation to them, exactly as an ordinary land-plant does. Yet the leaf retains the dissected type, proving that this "acquired character" has become fixed and is hereditary.

Another effect of water is to arrest the development of the first or axial root of any dicotyledonous plant germinating and growing in it. The result is that as the stem grows it increases in diameter upwards till it forms an inverted cone, and then secondary roots are supplied from the joints ; so they look like tent-ropes supporting it. This feature is characteristic of all members of the class Monocotyledons, as well as all aquatic Dicotyledons, so the conclusion follows (based, however, on a great number of other coincidences as well) that the former Class was descended from aquatic dicotyledons ; but it must have been at a very early period, for no monocotyledon has submerged, finely divided leaves ; all they produce is a flat petiole giving the ribbon-type as seen in all grasses, sedges, &c., with the "veins" running more or less parallel from one end to the other.

If they produce a blade, it follows at the end of the flat petiole, when it reaches the surface and floats, or rises into the air as in the Arrowhead.

Water may equally affect the flowers. Thus the Mare's-tail family contains genera with very degraded flowers. The Starwort (*Callitriche*) has only a stamen for a male flower and a pistil for a female ; while the Sea-wrack (*Zostera*) is in the same degraded condition.

Many aquatic dicotyledons are dwarfed, with very narrow leaves and imperfect flowers, e.g. Water-blinks of the Loose-strife family ; the Shore-weed, allied to the Plantains ; the Mudwort, to the Foxglove ; the Marsh Samphire, to the Goosefoots, &c. ; while the Duckweeds are most degraded of all. There is no distinction between leaf and stem, and the male and female flowers consist of the stamen and one carpel respectively. Botanists regard them as degenerate affinities of the Arum family.

Degradations through Drought.—Let us now see the results of impoverishment. Many little annuals live habitually in dry waste ground or in very gravelly or sandy soil. The common effect of semi-starvation is to reduce the size of the whole plant, and of each of its organs. The following are a few examples from various families. The Vernal Whitlow-grass, abundant in walls, paths, &c., with its leaves half-an-inch long in a rosette, and small, white petals, belongs to the Crucifers ; the Pink family includes the very small tufted Pearl-worts, as *Sagina apetala* (4-10 inches), so called because it has minute petals or none at all. Like the preceding, it is found on wall-tops &c. The All-seed, *Radiola linoides* (1-4 inches) frequents sandy ground.

It is a minute annual belonging to the Flax family, with tiny flowers. A genus of the Sedum family, *Tillaea muscosa* (1-2 inches) is a dweller on sand, a minute, slightly succulent annual. The stem is only 1-2 inches high. *Cicendia pusilla* (1-2 inches) is a tiny member of the Gentian family, occurring on sandy commons in Jersey. Many others might be mentioned.

Of course many plants often get starved, but do not lose all at once the power of growing into larger plants, when plenty of water and a good soil are present. Thus, a plant of the Silverweed (*Potentilla anserina*) growing on a dry roadside had leaves 2½ inches long. One half of this plant was transferred to a garden and supplied with an abundance of water, being also slightly shaded. It ceased to develop the silvery hairs on the upper surface, always present in strong sunlight and dry situations. It now bore leaves a foot and a half in length and 5 inches across from tip to tip of the leaflets.

But the species mentioned above have become habituated to a poor soil and impoverishment, and are not known by systematists as exceeding the heights as given by Hooker, or the inches mentioned above; these are therefore included in the specific characters.

A common effect of drought is the arrest of branches, whereby they become spines, as in our Furze (*Ulex*) and the Needle-furze (*Genista anglica*). The leaves also may become reduced to a rigid, pointed and needle-like form, as occurs in Heaths and in Junipers.

That this is the result of a want of water is shown by the fact that if the seeds of the spiny restharrow (*Ononis spinosa*) be sown in soil kept permanently wet the plants grow up with much reduced needle-like spines in the first year, but in the second they grow out into leafy and flower-bearing branches. Then it resembles the "armless" species *O. inermis*, found wild on better soils than that of hard roadsides.

In dry tropical countries there are the so-called Thorn-forests, as spinescence is the prevailing feature. Similarly the Cactus family has the leaves reduced to spines in the members growing on the Mexican deserts.

The needle-like form, as of leaves of Junipers &c., may take on a still more degraded type, so that the leaves become as it were minute scales pressed flat against the shoot. The Junipers often have both kinds on the same plant, but the first to be formed is the longer, spinescent form, the later, the minute, non-spiny one. This type is familiar in the Ling (*Calluna vulgaris*) as compared with the Heaths (*Erica*). It is seen in our shrubberies in the Thujas and Cypress, as well as so-called Retinosporas. Indeed, our Speedwells are represented by high mountain forms in New Zealand which take on a similar form in the dry altitudes, just as our Lycopodiums or Club-mosses prevail on Snowdon, the branches being "clothed" with minute, scale-like leaves. Lastly, leaves may vanish altogether. This is the case with our Broom, in which the green stems and branches now undertake the physiological functions of leaves.

Alpine and Arctic Degradations.—Mountain plants of the higher and drier zones cease to be able to grow tall, and exist as dwarfs ; consequently so many form excellent rock-plants for gardens, as the flowers of high alpine plants are often more brilliantly coloured than those of the lowlands. Beyond the tree-zone, some trees manage to reach high latitudes, but they cannot grow beyond 1 to 3 or 4 feet, as the Norway Spruce and the dwarf Birch, which is about 1 foot in height.

If we turn to any flora, we find the systematic botanist takes all the features mentioned as specific or generic characters, because they are constant ; and the plants cannot be otherwise characterized and recognizable by the student who wishes to study plants and compare them with the descriptions given ; yet those very features are simply the result of varying degrees of impoverishment and degeneracy.

Degradations through Parasitism and Saprophytism.—One of the most characteristic examples of degeneracy is seen in parasitic and saprophytic plants, which live upon others or on decayed organic matter, respectively. Typical examples of such plants have no green leaves or stems. The cause of their absence is the fact that they do not require them ; since all plants which live in the earth derive the main source of their tissues—carbon—from the carbonic acid gas of the atmosphere. This is absorbed and the carbon taken to form starch, the first visible result of such food. Since, however, the " host-plants " of parasites can supply it, as also does decayed vegetable matter for saprophytes, parasites and saprophytes become degenerate plants in this respect, and develop no chlorophyll, which makes leaves and shoots green.

The family of Broomrapes (*Orobanche*) and the Dodder—a member of the Convolvulus family—are familiar parasites. Some orchids, as the Bird's-nest Orchis (*Neottia Nidus-avis*) and the rare Coral-root Orchis (*Corallorhiza innata*), are saprophytes as well as the Bird's-nest (*Hypopithys multiflora*) allied to the Heath family.

In all these the leaves are represented by white or somewhat coloured scales, and, of course, supply the systematic botanists with specific and generic characters.

Thus is it that the evolution of plants proceeds in two directions ; but whatever they may be, it is always the result of self-adaptation to the conditions of life, or, as Darwin expresses it in his alternative to the theory of " Natural Selection," they are the " results of the direct action of changed conditions of life, without the aid or means of Natural Selection."

PRUNING HARDY SHRUBS.

By E. BECKETT, V.M.H.

[Read March 24, 1914; Prof F. KEEBLE, M A , F R S , in the Chair.]

THE study of horticulture is undoubtedly very fascinating, and of the very many different branches of the subject there is none more so than that dealing with Hardy Shrubs, nor one, I should imagine, that numbers so many devoted adherents in the present day.

The love of outdoor gardening, which has become so apparent in the last decade or two, is largely responsible for the great interest taken, especially by amateurs, in ornamental shrubs, but a great impetus has been given in this direction by the introduction to our gardens during the last few years of so many beautiful and distinct new species and varieties from the Far East.

For many years to come the problem of cultivating and proving the adaptability of the Chinese introductions to the climate of Great Britain will afford the keenest pleasure to all who take more than a passing interest in the art. I have been privileged to grow a large number of Mr. WILSON'S introductions, and it is very satisfactory to be able to record that the large majority of shrubs collected during his first three expeditions have proved themselves perfectly hardy, and beautiful additions to our gardens.

The introductions emanating from British and Continental nurseries in the past few years have been confined principally to certain genera, such as the Lilacs, Philadelphus, and Deutzias, the large majority being improvements on previously existing varieties.

The pruning of shrubs was until recently looked upon as necessary in some cases, but all too frequently it was left to an inexperienced workman who, it was thought, could do all that was required with a pair of shears once a year, and, alas! this is often the case even now. Thanks, however, to the experiments which have been made in many private and some national gardens, the results of good and bad pruning have clearly demonstrated that careful and intelligent pruning is as necessary to shrubs as careful and intelligent planting.

The correct pruning of shrubs is important for several reasons, and competency can only be acquired by actual practice and a careful study of individual requirements.

While no specific rule can be laid down, it is safe to say that nearly all deciduous shrubs produce their blossoms in the spring and early summer months on young wood of the previous year's growth, and these are improved and stimulated by having the flowering stems cut away entirely as soon as the blossoms have fallen, so that



FIG. 1.—*ACER PALMATUM SEPTENLOBUM ELEGANS*



FIG. 2. *COLETTIA CRUCIATA*.



FIG. 3 CHOISYA TERNAIA



FIG. 4. — *VERONICA LIGUSTRIFOLIA*.

new wood thrown up from the base may have as long a season as possible and become well ripened. A warm, dry autumn is very beneficial to this class, and productive of abundant bloom the following year.

Deciduous shrubs grown for the beauty of their coloured stems in winter are becoming deservedly popular, and so far as pruning is concerned, these are in a class by themselves, and it is only by severe pruning that their full beauty can be brought out.

The pruning of shrubs affords much enjoyment to many amateurs, and is much more than a passing pleasure, for by assisting to build up properly developed specimens of rare and beautiful shrubs a lasting monument is created of which one may well feel proud. Nowadays it is no uncommon thing to find many ladies and gentlemen of wealth devoting nearly all their spare time to the cultivation of hardy shrubs and trees; and some are very much better informed in the art of pruning than many of our so-called practical men, as it is only by close observation that the correct pruning of the large number now under cultivation can be efficiently carried out.

Every lover of beautiful shrubs who aspires to undertake the pruning of them should be well equipped with a suitable set of tools, and these should always be kept in the best possible condition. There are now many very excellent and easy-cutting tools which can be selected and purchased from most of our leading nurserymen and sundriesmen throughout the country.

Probably the various kinds of shears are amongst the most useful inventions adapted to gardening, but in my opinion, though I may hold conservative views as to this, nothing has yet been invented to surpass a well-sharpened pruning-knife.

The long-handled tree-pruners, which are made in various lengths, are unquestionably the most simple and useful implements for pruning branches that are out of arm's reach, as they enable one to decide precisely what to cut away and what to leave, so that the plant may assume the desired shape. A pruning-saw is another very necessary tool, as the long, narrow blade can be used on branches where an ordinary hand-saw would be too big and a knife not strong enough. There is now on the market a very handy form of pruning-saw attached to a long wooden handle of 10 or 12 feet. The teeth of this saw are set in the opposite direction to that of ordinary hand-saws, and this enables the user to manage the implement with much greater ease than if they were set in the usual manner.

For stout branches a large hand-saw is essential, and it is an advantage if it be small-toothed, as it will not tear the wood as a coarse-toothed saw does. It should be unnecessary to emphasize the desirability of keeping well sharpened all saws used for pruning, for when sharp the work is not only done quicker but also very much better.

Two or three chisels of different widths should be kept for paring the surface of any branch that has been cut with a saw, for a smooth.

surface soon heals over, whereas a rough one holds moisture which frequently means the beginning of decay, and through such cuts fungi may enter the tissue of the plant. For this reason it is a wise precaution to paint over with gas-tar all cut surfaces of more than an inch in diameter, as, in addition to keeping out moisture, fungus spores, and insects, it renders the cut surface less conspicuous than would be the case if it were left as cut. A light, strong pair of steps is useful for pruning subjects that cannot be reached from the ground, and which it is desirable to prune with knife or sécateurs rather than with a tree-pruner.

Arbutus Unedo.—This beautiful shrub, a native of Southern Europe and also found wild in Ireland, requires little pruning except to keep it in a shapely condition. But when, through overcrowding, it is allowed to become straggling, it can safely be cut hard back to within 2 feet or 3 feet of the ground during winter or early spring, when it will be found to break freely and eventually make a fine plant.

The Chilian *Aristotelia Macqui* and its variety *variegata* are charming evergreen shrubs and should be cultivated in all gardens, except in very cold situations. Like the foregoing, they require but little pruning.

Barberries, which are increasing in popularity, and of which there are a large number of evergreen and deciduous species, all answer well to pruning and will break freely from young wood or old. Such species as *Berberis japonica*, which frequently become unsightly-looking, may be cut to the ground early in spring, when they will be found to make splendid growth and shapely plants in a short time.

Many of the newer choice species from China quickly make splendid specimens and require but little pruning. Unfortunately, some of the more choice varieties are frequently worked on the common *B. vulgaris* stock, a practice which certainly should be condemned, as the greatest care possible is needed to prevent the stock outgrowing the variety.

Bupleurum fruticosum, or Hare's-ear, is a beautiful shrub from the Mediterranean region and is not grown nearly as largely as it deserves to be, probably owing to the fact that, when planted in a mixed shrubbery and treated as the majority of shrubs are, it becomes an unsightly and weedy-looking object. If, however, it is severely pruned annually in March it produces a wealth of fine flower-heads during late summer, and at all times its beautiful glaucous foliage renders it a conspicuous object.

Aucuba japonica and its varieties require little pruning when in a young state, but all answer well to the knife, and large, old specimens may be cut down to the ground during early spring, when they will be found to put forth strong, vigorous young growth, producing fine foliage.

Escallonias.—Some of the newer varieties of the *Escallonias* make delightful specimens when nicely arranged about the shrubberies, and

especially so in warm situations. They require knifing in occasionally, either immediately after flowering or in early spring.

Cassinia fulvida, sometimes called *Diplopappus chrysophyllus*, a New Zealand plant, should be grown for its distinct foliage and wood. It succeeds well in partial shade, requires little pruning, and much resents being cut into the hard wood.

Garrya elliptica is a native of California, and though none too hardy for the shrubbery is nevertheless worthy of a place wherever it will succeed. The male plant, when covered with its catkins, is a distinct and most beautiful feature.

It requires little pruning except to keep it in shape, and any pruning necessary should be done after flowering. Though the male plant is the most showy when in flower, the female should also be grown for the sake of its purple-black fruits in autumn.

Cotoncasters.—These are every day becoming more popular, owing much, no doubt, to the wealth of magnificent new varieties recently introduced from China. They require little pruning, just sufficient to keep the plants in a shapely condition, and this should be done in spring. Some of the older and more common varieties, for example *Simonsii* and *microphylla*, may be cut to within a few inches of the ground if necessary, as is sometimes the case when they are planted in masses.

Cistuses.—To keep these within bounds, especially the strong-growing varieties, they should be pruned annually immediately after flowering. Even quite small plants should be treated in this way, as few plants more resent being cut into hard, old wood.

The Tree Ivies, arborescent forms of *Hedera Helix*, are not nearly so largely grown as they deserve to be, some of the varieties being most beautiful. They may be grown either as dwarfs or standards, and, being perfectly hardy, will succeed in any position, and are invaluable in shade.

They respond well to pruning, which may be done at almost any season of the year, but preferably in spring, and pruning is often necessary to keep them within bounds. They will break away thickly even when cut into hard wood.

Hymenanihera crassifolia, from New Zealand, should be grown in every garden. It makes a compact and beautiful shrub, and when covered with its white fruits is exceedingly interesting. It requires but little pruning, and that is best done in spring.

Baccharis patagonica, and *B. halimifolia*, the Groundsel Trees, require pruning to keep the bushes in a shapely condition, but do not break well when cut into very old wood.

Ilex.—Most varieties of the Holly require some pruning to keep them shapely, and such pruning is best done about the middle of July.

The shrubby forms of Honeysuckle (*Lonicera*), of which there are now a host of very beautiful varieties, must have special attention in the way of pruning if the plants are to be kept symmetrical and interesting, or they soon assume a weedy growth and become much

disfigured by wind and rain. They should be cut hard back after flowering.

The majority of Privets (*Ligustrums*) require severe pruning to keep them compact and of good appearance. Many of the newer forms are distinctly beautiful both as regards their elegant growth and the fine trusses of flowers which many of them produce. They should always be pruned in early spring.

Viburnums.—A great number of the newer forms are most interesting, and require moderate pruning after flowering to keep them shapely. *Viburnum Tinus*, commonly called Laurustinus, and its varieties answer well when severely cut into the old wood. Such severe cutting, when necessary, should be done in early spring.

Ulex europæus, Furze or Gorse, and its varieties respond admirably to severe pruning. This is best when done every five or six years, and the plants cut to the ground immediately after flowering, whether grown in beds, masses, or as single specimens. Where ground game abounds it will be advisable to protect the young growth for the first year.

Phillyreas require but little pruning in a young state, but when desirable it may safely be done at any period of the plant's life. Even very large specimens may be pruned to within a foot or two of the ground during early spring. They will be found to break away freely afterwards. In fact, such severe cutting appears to impart new life to the plants, which in a short course of time will make dense, shapely bushes.

The shrubby New Zealand Veronicas do not like severe pruning, especially when cut into hard wood. Such pruning as is necessary should be done after flowering.

The Mexican Orange Blossom, *Choisya ternata*, does not usually require much pruning, but if by chance the plants become unhealthy, as they sometimes will, they should be cut down to the ground.

Buddleias.—Many of the newer varieties of *B. variabilis* are really magnificent, and the best of them should be grown in every collection. To keep the plants shapely they should be severely pruned during the second week in April. If pruned too early, late spring frosts may injure the growths. The old *B. globosa* is always an attractive plant when in flower, though one frequently meets with poor, straggling specimens. Such may be pruned well back into hard wood about 2 feet from the ground, when it will be found that they will readily make fine, shapely plants, and flower abundantly.

The American Allspices, *Calycanthus floridus* and *C. glaucus*, should always be included in the collection, and to keep the plants neat should always be pruned immediately after flowering.

Caryopteris Mastacanthus, from China and Japan, is one of our most beautiful late-flowering subjects, and when well grown and covered with its beautiful blue flowers forms one of the most conspicuous objects in the garden in late autumn. It should be hard pruned in spring.

Kerria (or *Corchorus*) *japonica*, and its varieties, may be pruned

either immediately after flowering or during autumn and early spring.

Hamamelis or Witch Hazels.—These are slow-growing plants, but, flowering as they do in mid-winter, are extremely valuable. They require very little pruning, which, when necessary, should be done after flowering.

Leycesteria formosa is best pruned to the ground annually, when it will be found to produce strong growth and a wealth of blossom during late summer and autumn.

Paeonia Moutan, from which the Tree Pæonies are derived. They are slow growers, and the chief pruning required is to see that the stocks on which they are generally worked do not get the better of the variety. The seed-pods should be taken off immediately after flowering.

Abelias.—Though a little tender, these plants are worthy of cultivation by all. Except for occasional knifing in after flowering, they require little further pruning.

The Lead Plant, *Amorpha canescens*, and the False Indigo, *A. fruticosa*, natives of the United States, are somewhat straggling growers, and should be severely pruned annually to keep them within bounds.

Chimonanthus fragrans, known as Winter Sweet or Winter Flower, from China and Japan. I have never before seen this winter-flowering shrub so beautiful as it was during the past month of January. When seen on a fine day, covered with its beautiful, fragrant blossoms, it is a sight to be remembered. It should be treated in the same manner as *Calyculthus*.

The *Corylopsis* are somewhat slow-growing plants, though very beautiful. When it is found that these are not growing away satisfactorily, we have found it a good plan to cut them down close to the ground, much as one would a Hazel, the first week in April, after which they invariably grow away freely and make fine plants.

Forsythias are amongst our most beautiful, yellow, early-flowering shrubs, and may always be relied upon to give a wealth of blossom. They require pretty hard pruning as soon as the flowering season is over.

The *Euonymus* all respond well to pruning, which should be done in early spring.

The Pearl Bushes, *Exochorda*.—These should be allowed plenty of room, as they grow very strongly and make large bushes when in good soil. When pruning is necessary it should be done directly after flowering.

The Sweet Gale, *Myrica Gale*, should always be included in a collection of shrubs on account of its delicious fragrance. Very little pruning is necessary, beyond keeping the shrubs in shape, and this should be done in early spring.

Hypericums of sorts do not, as a rule, require a lot of pruning, but it is quite safe to knife them pretty hard when the necessity arises.

Diervillas or *Weigelas* require pruning occasionally to keep the

plants shapely, and this is best done as soon as the flowering period is over.

Cydonia japonica and its varieties should always be allowed plenty of room to develop, and when this is done little pruning is needed.

Philadelphus.—Few flowering shrubs have come more to the fore than these during the last few years, and no garden where shrubs are cultivated is complete without some of the better varieties. They answer well to pruning, and some of the stronger-growing varieties require severe pruning. This is best done immediately after flowering or in early spring.

Deutzias.—Owing to the introduction of such a number of fine new varieties, these now form a very important group of flowering shrubs. Like the varieties of *Philadelphus*, they all respond well to the free use of the knife, when such is necessary, and should be treated like them.

Cytisuses and *Genistas*.—All the stronger-growing species require to be annually pruned to keep them within bounds, which should be done immediately after flowering in all cases. It should be noted that they seldom break satisfactorily when cut back into old, hard wood.

The North American *Chionanthus virginica*, or Fringe Tree, may be grown as a bush or treated as a wall subject. In either position it is a most worthy object. It should be pruned after flowering.

Clerodendron trichotomum, from China and Japan, is hardy when planted in sheltered situations in most parts of the country. It should never be allowed to be crowded by surrounding shrubs, and requires very little pruning.

Coronilla Emerus, the Scorpion Senna, should be pruned after flowering, when necessary.

Cornus, the Dogwoods.—Many of these are especially beautiful during winter. This applies more particularly to the *Cornus alba* section which, when planted in masses or as single specimens and cut down to the ground annually during the first week in April, are strikingly handsome during the winter months. Others, such as *brachypoda*, *florida*, *Kousa*, *macrophylla*, and *Nuttallii*, make quite small trees and do not require such hard pruning, but by no means resent it when necessary to keep them in a shapely condition.

Colutea arborescens, the Bladder Senna or Bladder Nut, is extremely interesting when covered with its conspicuous fruits. Though by no means a rare or choice subject, it should be planted in all large collections. It needs pruning in early spring.

The varieties of *Hibiscus syriacus*, or *Althaea frutex*, as it is often called, should be allowed plenty of room in a sunny position, when hardly any pruning will be required, as they are very compact-growing plants.

Hippophae rhamnoides, the Sea Buckthorn, though it has a reputation for doing well near the sea, may be equally well grown inland. Both sexes should always be cultivated in close proximity. It may be pruned, but not too severely, in early spring.

Hydrangeas, of which there are now many sorts, may be pruned in early spring to keep the plants shapely.

Ceanothus.—The majority of these beautiful flowering shrubs are worthy a place in all collections, and though generally treated as wall plants, except in the very coldest parts of the country they should always be included, as they make fine bushes and produce an abundance of flower at various times of the summer, and blue-flowering shrubs are not too plentiful. They answer well to pruning, which should always be performed after flowering.

Sambucus.—To keep these at all within bounds severe annual pruning must be resorted to, and is best carried out during the last week in March.

The pretty Spanish Broom, *Spartium junceum*, of Southern Europe, though somewhat common, is worthy of inclusion in every collection, as it is an especially beautiful decorative subject when cut. Pruning should be done in the spring.

Rhodotypos kerrioides, from China and Japan, is one of our most continuous flowering shrubs, and is seldom out of flower throughout the summer. This should have plenty of light and air, and very little pruning is needed beyond taking out some of the strongest growths to keep the bush in shape.

Potentillas.—The shrubby forms of *Potentilla* rank amongst our most beautiful dwarf flowering shrubs, and if allowed plenty of room, light, and air, need very little pruning, except the occasional shortening back of the strongest growths, which should be done just before growth commences in spring.

The *Rhamnus* only require cutting into shape in the spring.

Stephanandra Tanakae and *S. flexuosa*, natives of Japan, are charming subjects and answer well to pruning, and if from any cause they are in an unsatisfactory condition they may be pruned well to the ground, after which strong growth will be produced. The beautiful brown colour of the wood in winter renders these most attractive subjects.

Spiraea.—The various species of this large family of shrubby Spiraeas do not by any means all require the same methods of treatment in pruning.

The variety of *S. japonica*, known as *callosa*, should be pruned hard during the winter months, and the same may be said of *S. Douglasii*, *S. hypericifolia*, *S. salicifolia*, and *S. chamaedrifolia*, whereas such beautiful plants as *S. discolor*, *S. arguta*, *S. bracteata*, *S. media*, *S. Henryi*, *S. Thunbergii*, and *S. Wilsonii* simply require pruning at intervals to keep the plants shapely and within bounds. Such strong-growing varieties as *S. arborca*, *S. Lindleyana*, *S. sorbifolia*, and *S. Aitchisoni* require pretty severe pruning about the last week in March.

Rhus or Sumachs are grown principally for their intense colouring in the autumn. All the varieties known to me are certainly worthy of cultivation. If grown in groups or beds and cut down to the ground annually many of them create charming effects, but pruning

should never be done before the first week in April. I have seen many fatal results owing to pruning in mid-winter.

Salix or Willows.—A few sorts of these will create a charming effect in the winter months if grouped together and cut down to the ground annually during the first week in March. *Vitellina* and *cardinalis* are two of the best for so treating.

Symphoricarpus.—Though by many these are considered mere weeds, they are not such if properly treated. The common *racemosus* should be planted in beds by itself in the open and pruned to the ground annually, then it will be found to fruit most freely and create a pleasing effect in winter. The new variety, *Symphoricarpus racemosus* var. *laevigatus*, for which we were awarded a First-class Certificate in the past year, is a distinct and beautiful addition. Our plants at Aldenham last season were most conspicuous, the branches being completely weighed down with fruit. This should be pruned in early spring. *S. orbiculatus* (or *vulgaris*) var. *variegatus* makes a charming bed when planted alone. It should be lightly pruned annually, and about every seven years cut down to the ground.

Syringas, commonly called Lilacs, include not only a great number of improved garden varieties at the present day, but there are also many species. Unfortunately, the majority are worked on the common *S. vulgaris* stock, and care is needed to prevent the stock outgrowing and taking the place of the variety grafted on it. I am glad to know that some of our English nurserymen are now cultivating them on their own roots, a practice certainly to be commended. The various varieties and species should be pruned immediately after flowering, which will not only keep the plants rigid and shapely, but will also induce them to break and make flowering buds for the following year.

The Tamarisks, or *Tamarix*, are well known by reason of their delicate foliage and pretty pink heads of flowers, and give the best results when pruned in spring to within two or three inches of the base of the previous year's growth. By this method the plants are kept dwarf and compact. They are amongst the few things that succeed close to the sea.

Ericas (Heaths).—The majority of these delightful small-flowering subjects are easily kept within bounds by pruning the young growths back immediately after flowering.

Hardy *Azaleas* are too slow-growing to need much pruning, but if by any chance the plants have become overcrowded and drawn, they may be moderately pruned with success immediately the flowering period is over.

Rhododendrons require but little pruning beyond that the stocks on which the majority of the best varieties are worked should be examined annually and all suckers carefully removed. The flower-heads should always be picked off immediately the flowers are past their best. *Rhododendron ponticum*, and its hybrid varieties which are raised from seed, and which grow rampantly in many districts,



FIG. 3. SPIRAEA CANESCENS

U. S. G. P. 10



FIG. 6 —SPIRALA MEDIA



FIG. 1. *COENUS BRACHYPODA* (STANDARD) AND
C. ALBA-SIPIDICA VARIEGATA (PUSH)



FIG. 8 - SPIRAEA DISCOLOR

may, if necessary, be cut close to the ground in early spring, when they will be found to break away freely ; and in the case of transplanting large specimens much better plants and results will follow if these are pruned close to the ground, though it may seem a waste of time and material to do so.

CONIFERS.

It is not my intention to deal largely with these, as it is pretty generally known that some species and varieties benefit by moderate pruning. For example, nearly the whole of the *Retinosporas* make far better specimens when they are annually pruned, and instead of the poor thin looking objects one frequently meets with, by such pruning they may be kept dense and present a very pleasing appearance.

Thuya dolabrata is one of our most beautiful evergreen subjects when seen at its best, but it has a habit of producing many leading growths. These require shortening back, with the exception of the most promising one, from the earliest stages of the plant's growth. Large, shapely, well-grown specimens of these are most imposing.

The Common Arbor Vitae and *Thuya gigantea* also respond well to close pruning, and make invaluable hedges for shelter.

Many of the Junipers are much improved by a moderate amount of pruning annually, just before growth commences in spring.

Taxus baccata, the Common Yew, as is generally known, responds splendidly to the knife and may be cut to almost any shape required. Other varieties of this family may be pruned in as required.

CLIMBERS.

The majority of climbers, of which happily there is now a very large and beautiful collection, require to be thinned out, pruned back, and tied in during the winter months. Many of them will also need constant attention during the growing season. This work must not be done indiscriminately or very much of their beauty will be marred. One frequently notices climbing plants ruthlessly treated by unskilled hands, the growths that should be left to produce flower being cut away.

The various kinds of Ivies used as climbers should always be cut in, in late summer, allowing a sufficient time for new growth to be made to clothe the building or other object against which they are placed with healthy green foliage for the winter.

Loniceras of sorts should be pruned in after flowering and thinned out during the winter.

Polygonums should be treated in the same way.

Smilax, of which there are now many good sorts, require but very little pruning, and it is best done towards the end of the summer.

All species of the *Vitis* should be pretty severely pruned during the winter months, and during the growing period many of the stronger varieties will require stopping and thinning out.

Wistarias should be pruned during winter or early spring.

Though I have done my best, I fear my Paper will convey but a scant idea of the art of this important subject of Pruning. I may mention that through the kindness of my employer, the Hon. VICARY GIBBS, the gardens and grounds at Aldenham Park are always open for inspection to any who may be interested in horticulture.

THE CULTIVATION OF HIPPEASTRUMS.

By C. R. FIELDER, V.M.H.

[Read April 7, 1914; Prof F KEEBLE, D.Sc., F.R.S., in the Chair.]

A FEW words concerning the origin of hybrid Hippeastrums may not be without interest to those who are unacquainted with the subject. The species from which the hybrids of the present day have descended are natives of South America, and those most extensively used have been *Hippeastrum vittatum*, a very beautiful species with white flowers having red stripes on each petal; *H. psittacinum*, a very striking flower, green and scarlet; and *H. pardinum*, cream, spotted with crimson.

Beautiful as these species are both in form and colour, they are immeasurably outshone by their offspring of to-day. This great advance is due to the work of hybridists both on the Continent and in this country, amateurs and nurserymen having begun to raise new varieties upwards of a hundred years ago.

As early as 1799 a watchmaker named JOHNSON, of Prescott, Lancashire, began hybridizing, and by crossing *H. Reginae* and *H. vittatum* produced *H. Johnsoni*. Hybridists on the Continent began the work still earlier. The Messrs. DE GRAAFF, of Leiden, had raised hybrids in 1790, and I believe the firm still continues the work. Messrs. LEE, of Hammersmith, were very early raisers of hybrids in this country, and were followed by Messrs. JAMES VEITCH of Chelsea, WILLIAMS of Holloway, and KERR of Liverpool. Notable among the collections of amateurs in this country is that of Sir GEORGE HOLFORD at Westonbirt, where many fine varieties have been raised, and the plants splendidly cultivated during the past fifty years or more.

I believe many people have refrained from taking up the cultivation of hybrid Hippeastrums on account of an idea that they require great heat, in addition to a hotbed for their successful cultivation. No doubt they may be well grown under those conditions, but my experience, after having grown them largely for upwards of twenty years, is that they may be thoroughly well grown in a minimum temperature of from 55° to 60° F., and entirely without the aid of bottom heat or hotbed. My point is that those who have hitherto been deterred from growing these magnificent bulbs by inability to provide them with high temperature and bottom heat need not deprive themselves of the pleasure on that account.

Hippeastrums are propagated by seeds, and by offsets which

are thrown up from the base of the bulbs. These offsets are produced more or less freely by bulbs which have originated from seeds, but I cannot remember having seen an offset on a bulb which had been grown from an offset. The experience of others might, however, be different in the latter respect.

The offsets must not be severed from the parent bulb until they have independent roots, and have formed bulbs an inch or more in diameter. This size is usually attained by the end of the second year's growth.

The best time to separate the offsets and pot them up is at the beginning of February, just before the plants begin to make new roots. Having divided them carefully, the offsets should be placed in well-drained small pots, using a soil composed of three parts of good loam, half a part leaf-mould and half a part well-decayed manure and some coarse silver sand. The pots may then be placed in a light position on a front bench, or on a shelf, in a temperature of from 55° to 60° F. to start into growth. Very little water should be given to the plants until growth commences, a daily sprinkle overhead with the syringe usually being all that is necessary for the first ten days or so, providing the soil was in a properly moist condition at the time of potting.

Propagation by seeds proves a ready and interesting method of increasing the stock of plants, and at the same time it is possible, by judicious crossing and selection, to produce beautiful and interesting varieties, of which a fair percentage may be superior to their parents. As in the case of other flowers, indiscriminate crossing is not likely to effect much improvement, except by accident, and therefore it is necessary to have a definite object in view when pollinating a flower, and to keep it constantly in mind when making subsequent crosses, until the object be attained.

Of course, when a flower is to be fertilized by pollen from another plant its stamens must be removed before the pollen is shed, otherwise it will probably become self-fertilized. The plant should also be isolated, because, on a sunny day when the pollen is dry, the draught from the ventilators is sufficient to send it floating in the air, ready to pollinate any stigma with which it may come in contact, and so spoil the work of the hybridizer. When there is no house with a suitable temperature available for isolation, the flower may be enveloped in a sheet of tissue paper, which, being tied closely to the flower stem, will, with care, answer the purpose fairly well.

Plants flowering in April and May ripen their seeds in June and July, the bursting of the capsule indicating when the seeds are ripe. It would be difficult to imagine anything more unlike the ordinary conception of a flower seed than are the seeds of the *Hippeastrum*. They are extremely thin, about the size of a threepenny piece, and look like round, black satiny pieces of tissue paper, slightly thickened in the centre.

Although the seed will germinate freely at any time, it should be

sown as soon as it is ripe, to allow the seedlings to make good headway before winter comes. The seeds may be sown thinly in a pan, or in 5-inch pots filled with a soil composed of two parts loam, one part leaf-mould, and some sand. A quarter of an inch of fine soil should be sifted over the seeds. After giving them a watering the pots should be stood in a warm moist hothouse, preferably under a handlight or propagating frame, where the seeds soon germinate. The pots should then be placed on a shelf under the shade of a thin blind and the watering carefully attended to. Here the seedlings will make sturdy growth, and when they have begun to make the third leaf they should be potted singly into thumb pots, using the same compost as before. The plants should again be placed on a shelf, and so long as there is room for the plants to grow without touching the glass, there is no better position for them, until they require larger pots. Here, if the watering is well attended to, the young plants will make such progress that by May they will usually require to be placed in 5-inch pots. This time the soil should be richer, and a compost consisting of three parts loam, half a part leaf-mould, and half a part well-decayed manure, together with some coarse silver sand, will be found suitable. It cannot be too often repeated that the pots must be well drained. The plants may now be stood in a light position near to the glass on the front stage of the house.

Seedlings respond freely to liberal treatment, and by the autumn the strongest plants may require to be shifted into slightly larger pots, in which they should remain until they flower. Some cultivators rest their seedlings during the winter, but I think it is best to keep them growing continuously until they flower, which a considerable percentage of them will do in the following April—one year and nine months from the time of sowing the seed—at least a year earlier than seedlings which are rested.

After flowering, the seedlings should be treated in a similar manner to old bulbs.

Treatment of Old Bulbs.—The chief difference between the treatment of old bulbs and seedlings is that the former must be rested each winter after the completion of the season's growth.

In February old *Hippeastrum* bulbs are on the point of starting into growth, and this is the time when any repotting that may be required should be undertaken. Bulbs in large pots do not always need repotting each year. It is often sufficient to remove two inches or so of the surface soil and replace it with fresh compost, to which a little bone meal might be added.

The old soil having been carefully shaken from the roots of those plants that are to be repotted, they should be placed in pots of a size suitable to the dimensions of the bulbs. Large, firm bulbs, 3 inches or so in diameter, would need 7-inch pots, while for smaller bulbs 6-inch and 5-inch pots would be sufficient. It is better for the pots to be too small than too large.

When repotting has been delayed until the plants have started

into growth, they should be placed in larger pots without disturbing the roots.

During the process of repotting, some of the bulbs will occasionally be found to have few roots. This is generally the result of inefficient drainage, allowing the soil to become waterlogged, or it may be caused by the soil being too moist while the plants are resting at a low temperature. Such plants may often be restored to health by placing them in small pots, watering them sparingly for a time, and especially by not permitting them to flower for a year or two.

The soil may be the same as that previously recommended when potting seedlings into their flowering pots. About half the depth of the bulb should be below the surface, and the soil should be carefully shaken between the roots.

The bulbs may now be placed in a minimum temperature of from 55° to 60° F., where they will soon commence to throw up their flower spikes and foliage. Only an occasional watering will be necessary until growth commences; but they enjoy plenty of atmospheric moisture, and as the season progresses the syringe must be freely used to provide moisture and keep the foliage free from insects.

Under ordinary conditions the flowers are produced in April and May, but by starting a portion of the stock in a temperature of 50 degrees the flowering season may be lengthened. They may also be made to bloom in the winter months. Much depends upon how the plants are treated after flowering. They should be grown in a sunny position, and the watering and syringing well attended to, so that the plants may recover from the effects of flowering and build up good solid bulbs in readiness for the next year's flowering.

Towards the end of August the earliest plants will have completed their growth and should be freely exposed to sunshine and air, in order to mature and ripen the bulbs thoroughly, and for this purpose they may be stood in a pit facing the south. At this time less water should be given. When the oldest leaves begin to turn yellow and no young leaves are produced, it is a sign that the plant has completed its growth and is preparing to rest. Water must then be gradually reduced until most of the foliage dies down, after which only an occasional watering should be given to keep the bulbs plump. At the beginning of the winter the pots may be stood close together in a cool pit or house having a minimum temperature of from 40° to 45° F., where they may remain until February.

Winter Flowering Hippeastrums.—I think it is not sufficiently realized how comparatively easy it is to have these plants in bloom through the winter. It is true that bulbs which are made to bloom at that season are more quickly worn out, and therefore it is wise to use only the commoner forms for this purpose, retaining the better varieties to flower in their natural season. Where seedlings are raised there are always a number of inferior varieties, which might be very profitably devoted to winter flowering. The plants selected for winter flowering should be given every encouragement to finish

their growth and mature their bulbs early. Towards the end of July they should be placed in a cold pit and allowed plenty of air and light, and ultimately rested as already described. In December some of the most dormant of the bulbs might be placed in heat, others being introduced at intervals in order to give a succession of bloom.

The following season the plants which have been forced will go to rest earlier, and may be placed in heat in November, which is probably as early as there is any necessity to start them.

Winter-flowering Hippeastrums are best potted directly they have finished flowering, when, without disturbing the roots, they should be placed in larger pots or given a top-dressing of rich compost.

The important points, then, in the cultivation of Hippeastrums are :—

1. Early potting before growth starts.
2. Thorough drainage in the pots and the avoidance of over-potting.
3. Growing the plants in a light house and near the glass.
4. A moist atmosphere while they are in active growth.
5. Keeping them free from insects, especially Thrips ; and
6. Placing the bulbs in a lower temperature when at rest.

When these and other comparatively simple requirements are attended to, there are very few other hothouse bulbous plants that make such a good return for the work spent upon them.

A PROBABLE ORIGIN OF EXISTING FLOWERS.

By Rev. Professor G. HENSLOW, M.A., F.L.S., V.M.H.

[Read April 21, 1914 ; Mr. JOSEPH CHEAL in the Chair.]

FLOWERING plants are now grouped under two classes—Gymnosperms and Angiosperms ; while the latter has two divisions—Dicotyledons and Monocotyledons.

There is no doubt that angiospermous Dicotyledons were evolved from some, at present, unknown member or members of the gymnospermous plants of past geological ages ; while it has been proved by experiments and induction that Monocotyledons must have descended from aquatic Dicotyledons.

Many fossil plants of the Coal and later periods have been found which bear seeds, without carpels, possessing as well, both in their foliage and the internal structure of the stems, features which suggest their origin from Ferns. One of the groups is called Pteridosperms, i.e. "Seed-ferns." In these the spores of Ferns are replaced by pollen-grains, and the normal female structures are represented by ovules only, which become seeds.

Fossil plants of the Secondary Epoch were evolved from those of the Primary, which was closed soon after the Coal period. The great family of the Secondary Epoch, besides the Pteridosperms and the forerunner of the existing Cycadeæ, was the seed-bearing Cordaitales.

The prevailing forms of the inflorescences were catkins or cone-like structures consisting of bracts or scales bearing, or associated with, anther-cells, and ovules only.

There are only three families of Gymnosperms now existing, one, the Coniferae, having the largest number of genera and species, including the Pines, Junipers, and Cypress of the northern, and Araucarias of the southern, hemisphere. The other two have but few members. Thus the Cycadaceae has nine genera, while the Gnetaceae has only three, viz. *Gnetum*, *Ephedra*, and *Welwitschia*.

In no case can the actual line of descent of any living Gymnosperm be proved from extinct plants ; but there are several structures in each which strongly resemble one another, both in the vegetative organs—i.e. the roots, stems, and leaves—on the one hand, and in the reproductive organs on the other.

For a complete comparison the reader must consult Dr. D. H. SCOTT's *Studies in Fossil Plants*, but the following points may be here noticed.

If we take Ferns as our starting-point, much Fern-like foliage has

been long known as resembling the fronds of living Ferns ; but an interesting fact is that only a certain number has been proved to be true Ferns ; for many have been discovered to bear naked seeds, and therefore they must be excluded from the Fern family. These "seed-plants" are more nearly allied to certain of the Fern families which at the present day have comparatively few genera. Thus, besides the foreign families Marattiaceae and Schizaeaceae, we have three native Ferns in England which show alliance with the very ancient types. They are the Royal Fern (*Osmunda regalis*), the Adder's-tongue (*Ophioglossum vulgatum*), and the Moonwort (*Botrychium Lunaria*).

Our commonest Ferns are a later product of Evolution. Thus, the sporangium or spore-case of most existing Ferns has a strong, nearly complete ring of large cells, called the *annulus*, which contracts when the spores are ripe, and so bursts open the spore-case in order to liberate the asexual spores. This is wanting in the two last mentioned, and is very imperfect in the first.

One of the best-known members of the Pteridosperms is named *Lyginodendron*. The restored illustration as a frontispiece to Dr. SCOTT'S *Studies* is exactly like a tree-fern, with much-divided fronds ; but it has been discovered *with the seeds upon it*. The ovules are of a peculiar structure, but very closely resemble those of existing Cycads ; while the stamens have the anther-cells pendulous under a sort of peltate scale, resembling that of the Yew, *Araucaria*, and *Zamia*, allied to *Cycas*, as well as to the spore-cases of the cryptogamous Horsetail (*Equisetum*).

The ripe seed of *Lyginodendron* consists of a thick outer coat, and the embryo, presumably, was in the middle, though it appears to have disappeared from the fossil specimens. However, well-preserved dicotyledonous embryos are known in later fossils (e.g. *Cordaianthus*).

With regard to the existence of a carpel, nothing definite is known in fossil plants. The ovule had one coat corresponding to the "secundine" of living plants, and this was prolonged into a tube above the nucleus forming the "pollen-chamber" at the bottom. The tube sometimes expanded at the top, imitating a stigma, only it was open. I found a curious imitation of this in some self-fertilizing plants of the desert near Cairo, as in *Pulicaria arabica* ; the stigma was open at the top, leading to the ovules within in a sort of mock pollen-chamber. Something like one, but closed up, is seen in the base of the style in *Casuarina*. A good example of the trumpet-like ovular coat is seen in *Welwitschia* and *Ephedra* ; in *Gnetum* the ovular membrane does not extend above the nucleus.

Our own Juniper has three ovules clustered together, each being in front of a scale ; these scales leave an opening at the top, being slightly coherent below. When the ovules have been pollinated, the coherent scales close up, and so form the fleshy "Juniper berry." Each scale therefore might be called a "carpellary" scale, but the Juniper is strictly gymnospermous.

In *Ephedra* and *Welwitschia*, of the family Gnetaceae, there is an

additional covering round the ovule, which French botanists, especially, regard as a rudimentary carpel. But, as yet, no transitions are known between this elementary *open* condition and the *closed* carpel of all existing Angiosperms. All Gymnosperms leave the summit of the nucleus of the ovule exposed, so the pollen falls directly upon it.

Cordaiteae is the name given to a family of fossil plants which bore stamens and ovules. "They were tall, somewhat slender trees, with trunks rising to a great height before branching, and bearing at the top a dense crown composed of branches of various orders, on which simple leaves of large size were produced in great abundance." *

The veins of the leaves are repeatedly forked, unlike those of our timber trees (excepting the Pines), in which they are "reticulated" or "netted."

Cordaianthus is a genus of which the flowers have been preserved. They are in catkins or cone-like structures, consisting of bracts or scales. The males had one or more stamens in front of each. The females formed similar catkins, each scale having an ovule in front of it.

Although no true links are known between the cup-shaped, so-called "carpels," yet we can find some resemblances, if nothing more, between certain angiosperms and the fossil seed-plants. Turning to the catkin-bearing families, these are probably relics of much older and larger families, as indicated by their having so few genera at the present day. They are the *Cupuliferæ* (10), the *Salicaceæ* (2), *Platanææ* (1), *Juglandææ* (5), *Myricaceæ* (1), and *Casuarinaceæ* (1). *Cupuliferæ* (10) has three tribes: the first has two genera (Birch and Alder); the second has four genera, including the Hazel and Hornbeam; the third has four genera, including the Oak, Beech, and the edible Chestnut. Lastly, the *Salicaceæ* (2) contains only the Willow and Poplar.

The flowers are quite as simple as those of the fossil genera; the males consisting of a scale or bract with one or more stamens, the females of one or more carpels.

It is noticeable in the figure of *Cordaianthus*, as given by Dr. D. H. SCOTT (a genus of the group Cordaitales intermediate between Pteridosperms and the mesozoic *Cycadophyta*, leading up to our existing Cycads), that the anther-cells are distinct on a common filament. This perhaps may be attributed to the "forking" method of branching of the vascular bundles, so common in fossil plants, as in the leaves, still to be seen in the Ginkgo-tree (*Salisburia adiantifolia*; so called because the leaf strongly resembles the leaflets of the *Adiantum* or Maiden-hair Fern).

A similar separation in different degrees of the pollen-sacs or anther-cells is seen in several of the *Cupuliferæ*, as the Hazel and Hornbeam, *Myrica* and *Casuarina*. The anther-cells are also more or less distinct in the gymnospermous Coniferae, as of *Pinus* and *Araucaria*, &c.

With regard to the insertion or position of the ovules upon the carpel, it is familiar to all that they grow from the united *margins* of the carpellary leaf, as seen in a pea-pod. The vascular cords running

* SCOTT, *op. cit.* ii. p. 519.

up the two margins in the pod (*not* in ordinary leaves) give off branchlets to the ovules. These two marginal cords and the midrib diverge from a common vascular bundle in the stalk of the carpel.

In the Gymnosperms, mentioned, the position of the ovules is *not* upon the margins of the "carpellary scale," for they stand in *front* of the scale. In *Cycas*, however, we find something much more nearly like that of an Angiosperm; for although the carpellary leaf is still leaf-like, being pinnately divided, the ovules *are* borne along the two margins; but the blade is, of course, not closed over them.

The nearest approach to a regular flower may be represented by that of the fossil member of the *Bennettites* (the group approximating the living Cycads) of the Secondary Epoch. *Cycadeoidea* (the name implying "resembling a *Cycas*") has a whorl of hairy, lanceolate bracts, surrounding a whorl of stamens, consisting of a main axis with lateral anther-bearing pinnæ, for it is apparently formed out of a pinnate leaf.

In the middle of the flower is a conical receptacle covered with naked ovules.

Leaving undetermined as to *how* ovules become formed *within a closed ovary* for the future to discover, we will consider how the three outer whorls of ordinary flowers came into existence: namely, the calyx, composed of sepals; the corolla, of petals; and the stamens, consisting of the filament and anther.

There seems little doubt that the calyx represents the last leaves of the flowering shoot. These decrease in size and form bracts, and finally two, three, four, or five constitute the calyx, arranged in a whorl through the suppression of the flower-stalk to form the "floral receptacle."

Transitions between leaves and bracts are common enough. Thus the Hellebore shows how the petiole of the leaf becomes an oval, pointed bract, while in the Buttercup the bracts represent the dissected blades, the petioles being suppressed.

That a calyx with separate sepals originated from bracts appears to be seen in the fossil *Cycadeoidea* as well as in *Casuarina*, and especially the Alder (*Alnus*); for the male flower of this consists of four "bracteoles or sepals," as Hooker calls them, including four stamens; whereas in the Birch (*Betula*), the only ally of the Alder, there is a single bract with two stamens, forming each flower.

With regard to the origin of the corolla, this appears to be due to the response to insect agency; for the first indication of the appearance of petals is in the modification of the anthers into nectaries, and thence into petals, the filament being suppressed, as occurs in the Buttercups, e.g. *Ranunculus auricomus*; the anther is open above, the partition between the two cells is arrested, and the resulting tubular or cup-like structure becomes a "nectary" or "honey-pot."

To form a petal, one side of the tube remains short, while the other—i.e. the outer—enlarges into the lobe we call a petal.

In the Hellebores and Winter Aconite the nectaries remain as such,

and no true petals are formed, the calyx being white or taking on some colour for insect-attraction.

In *Atragene*, allied to the *Clematis*, which has no corolla, the outermost stamens have developed a honey-groove down the filament, and *this* now broadens into a petal. A similar transformation is seen in the Water-lily: the perfect stamens are next to the pistil; on others, the anthers decrease and the filaments widen till perfect petals are secured.

Carpels, such as a pea-pod, are more obviously metamorphosed leaves, being folded along the midrib with the margins meeting, cohering, and bearing ovules, really in two rows, one on each margin.

As to the origin of ovules, some abnormal foliaceous conditions of flowers reveal the fact that they are homologous with little foliar or leaf-like excrescences from the vascular cords of the leaf, which often give rise to little cups or funnel-like structures, as well as flat leaflets. Such have occurred in "monstrous" flowers of the Mignonette and some leguminous plants, &c.

Nature having thus evolved a simple flower, as of a Buttercup, in which all the parts are "free," the next step in adaptation to insect-visits is to unite the parts of one or more of the floral whorls respectively, by "cohesion." We thus get a cup-like calyx, this word being the Latin for a "cup." The purpose is often to support the corolla when the petals cohere and form a slender tube below.

It is the case especially when the corolla has a weak tube, but a large "lip" for a landing-place. To strengthen the calyx-tube, the original midribs of the leaves are supplemented by others inserted up the coherent edges, as in Labiates. As the number of sepals in this family is five, we now have ten ribs; but as the strain is all on the front of the corolla—i.e. on the lip—Nature adds three pairs of ribs, one pair on each side, and a third in front, but none at the back. They thus make thirteen strengthening ribs. In *Salvia*, however, which has a particularly large lip, a fourteenth rib is inserted between the additional front pair.

This example illustrates only one addition; but a flower of a *Salvia* has twenty or more special adaptive structures, and the only interpretation seemingly possible is that of Sir OLIVER LODGE, who says "Life is a Director of Forces"; so that it responds to all kinds of external influences by *directing* the inanimate, physical forces utilized to move inanimate matter (both matter and force being derived from food) so as to build up the purposeful structures required in every case.

In this way we seem to trace the origin of all kinds of floral structures, and thence the origin of varieties and species which are founded upon them.

FAIRY FLIES AND THEIR HOSTS.

By FRED ENOCK, F.L.S., F.E.S., F.R.M.S., F.R.H.S.

[Read August 12, 1913; Mr. GEO. GORDON, V.M.H., in the Chair.]

To some the title of my lecture may appear to be somewhat ambiguous, so I will at once say that the family of Fairy Flies consists of the most minute winged insects known to science—some of them measuring not more than one-ninetieth of an inch in length! (Fig. 9)

It was not until the year 1833 that they received any attention from entomologists, who evidently considered them too small to merit a name.

In that year they were named by the late A. HALLIDAY and FRANCIS WALKER, and were placed in the family of the Mymaridae, consisting of about twenty species. Unfortunately for science, no figures were given, but only short Latin descriptions from which only the genera could be identified. From this fact, it is not to be wondered at that few students were found to work at this much-neglected family.

In the year 1876 the Royal Microscopical Society held a conversation, and under one of the microscopes was exhibited by the late FREDERICK FITCH a minute insect, described as "A Fairy Fly caught in a Spider's Web." (Fig. 10.)

It was the sight of this most exquisite insect that first determined the writer to commence the study of the family, but this was easier said than done, for the materials were so meagre. The whereabouts of HALLIDAY's collection was unknown for several years, and when found in the Dublin Natural History Museum it was in such a dilapidated condition that it was not of much service. There were 167 specimens, mounted on small pieces of card, but so dirty and covered with crystals that it was next to impossible to name them until I had made an enlarged drawing of each specimen under the microscope, showing as much as possible the various parts, but here again the accumulated mass of dust and crystallization of nearly a hundred years had completely obliterated the delicate joints of the antennæ and tarsi. In spite of these drawbacks, I was enabled to identify the genera to which they belonged, but several of the most interesting types were missing from this collection.

The following names are those of HALLIDAY's genera: *Ooetonus*, *Litus*, *Mymar*, *Anaphes*, *Anagrus*, *Polynema*, and *Eustochus*.

To these, in 1846, F. WALKER had added *Arescon*, *Alaptus*, *Panthus*, and *Caraphractus*.

In the 'Entomologist,' vol. 6 (1872 and 1873), we find that the German entomologist FOERSTER added several new genera, about some of which there appears to be a little doubt as to their occurrence in Great Britain. Their names are as follows: *Camploptera*, *Limacis*, *Gonatocerus*, *Dorichlytus*, and *Stichothrix*. I have not yet captured the last two.

The Rev. T. A. MARSHALL, M.A., F.L.S., under the title of 'Hymenoptera Britannica,' gives a list of the British Mymaridae: *Ooetonus insignis*, *O. vulgatus*, *O. notatus*, *O. hemipterus*, *Limacis dimidiata*, *Litus cynipseus*, *Gonatocerus acuminata*, *G. pictus*, *G. litoralis*, *G. fuscicornis* and *G. crassicornis*, *Alaptus minimus*, *A. fuscus*, *Eustochus atripennis*, *Mymar pulchellus*, *Cosmocoma ovulorum*, *C. flavipes*, *C. fumipennis*, *C. pusilla*, *C. fuscipes*, *C. atrata*, *C. euchariformis*, *Caraphractus cinctus*, *Anaphes fuscipennis*, *A. collinus*, *A. longicornis*, *A. regulus*, *A. auripes*, *A. latipennis*, *A. punctum*, *Anagrus atomus*, *A. incarnatus*, *A. ustulatus*, *A. flavovarius*.

Strange to say, FOERSTER did not give any figures by which species could be identified; long descriptions of these microscopic insects are of little help to either young or old entomologists, and for some years I could do little more than collect and mount specimens in Canada balsam, which medium is the only one for permanent preservation, though most of the natural colours are lost—but these can be noted down before mounting.

From 1876 to 1907 (thirty-one years) I was the sole entomologist working up this hitherto much-neglected family of insects. In 1907 Mr. CHARLES OWEN WATERHOUSE, I.S.O., late of the Natural History Museum, commenced to collect the Mymaridae, and ever since has helped me in naming the numerous new genera and species which we have discovered. During a three years' sojourn at Woking (1882 to 1885) I was fortunate in discovering seven new genera, which we have since named as follows: *Stethynium triclavatum*, male and female; *Cleruchus pluteus*, male and female; *Parallelaptera panis*, male and female; *Erythmelus Goochi*, male and female; *Enaesus laticeps*, female only; *Stephanodes elegans*, male and female; *Dicopus minutissima*, female only; also at Richmond Park in 1908 *Oophilus longicauda*, males and females; and last year in August I added another altogether new to science, and which we christened *Neurotes iridescens*. Of this beautiful species I caught a male and a female. No doubt, were there more workers among this family, many more new species would be added.

The habits and economy of these Fairy Flies are so cryptic that it is a most difficult matter to follow them up, when circumstances prevent one from making continuous observations upon insects which are microscopic in size—all (so far as the writer knows) being ovivorous in their habits. Searching for the eggs of Lepidoptera is no easy matter, and my experience leads me to think that the Mymaridae do not oviposit in the eggs either of Butterflies or Moths, but in those of Homoptera, Hemiptera, and Coleoptera. The difficulty of

discovering the eggs of the two first named is increased from the fact that they are deposited in the stems and leaves of grasses and various plants, and it is only by careful dissection of such that the *host* eggs are found, sometimes embedded in the stem or actually between the upper and lower skins of a blade of grass! or in the soft pith of a rush (*Juncus*), where a large Frog-hopper occasionally lays a row of twelve to fifteen flask-shaped eggs, each of which may contain four to five larvæ of an *Anagrus*. In another species of Frog-hopper, another species of *Anagrus* lays but a single egg, the transformation of which from egg to perfect Fairy Fly I have frequently observed.

I first noticed that some of the rushes were covered, at the lower part, with rows of minute punctures, which, on being examined under the microscope, revealed the heads of from six to nine eggs. On stripping the outer covering from the rush, I found embedded in the white pith these flask-shaped eggs, fitting close together and white in colour—the head ends converging, so that the tips could just be seen through the hole in the rush. Some years elapsed before I discovered one September a Frog-hopper, *Liburnia* (Fig. 11), in the act of laying these delicate eggs; and when lying flat down on my stomach, with my head buried among the grass and rushes, I saw a Fairy Fly (*Anagrus*) walking up a rush, and as it walked it beat its clubbed antennæ against the rush, until they came into contact with the heads of the Frog-hopper's eggs, when the Fairy Fly showed great excitement as she rapidly examined and felt the eggs with her antennæ. In less than half a minute she protruded her ovipositor and pressed the tip against one of the eggs, and after straining a good deal the delicate auger went through and was driven half its length into the egg. For eleven minutes there was no apparent movement of the body, and then the ovipositor was slowly withdrawn and another egg attacked in the same manner. After this I observed the Fairy Fly go from egg to egg. In one case, immediately on the ovipositor being withdrawn, I isolated and cut open the host egg and succeeded in finding the egg of the Fairy Fly (Fig. 12), and in each one so dissected from the host egg I could with a high power see the nucleus and nucleolus. As the host egg was semitransparent, I could just detect the larva of the Fairy Fly moving about in the fluid matter. In March the larva appeared full-grown and about filled the host egg, the mass of cells being of a red colour. I then dissected several and made enlarged drawings. (Fig. 13.) The mouth was a sucking one—with two simple curved organs which I diagnosed as the mandibles. At each side of the mouth were soft fleshy protuberances, not unlike short stumps, which the larva used as forelegs. The tail was the narrowest part of the body, with a slight projection on the ventral side.

When full-grown, the body of the larva appeared full of reddish cells. In a few weeks these cells began to move slowly and crowd together, and as I watched them day by day under the microscope,

I saw them crowding closer together until a narrow curve was distinguished at the head of the larva, and other curved lines were formed by the red cells forming up into close order, which increased in intensity as more cells appeared to be attracted and drawn together, until in from four to five weeks there was a distinct form of the imago marked out by the massed cells, which week after week became more distinct (Fig. 14), and I could clearly see the shape of the head, thorax, and abdomen. Then the limbs were mapped out in the same wonderful manner, and just the delicate outline of the legs, ovipositor, antennæ, and wings. On turning to the head, I noticed some minute crimson specks at exact distances from each other, which after much thought I realized as the facets of the compound eyes! In two months from the time when the larva became full-grown, I had seen taking place under the microscope the formation, by the gathering together of the cells, of all the various organs of the embryo, which in another week or two appeared to have absorbed all the cells, which commenced to lose their red colour and become brown chiton, the various parts being more or less covered with hairs. After another week I could see the tiny jaws at work, endeavouring to nibble a hole through the old eggshell. (Fig. 15.) Some hours were occupied in this work before the tiny parasite was able to wriggle through the pith to the opposite side, where its further progress was barred by the thick green covering of the rush; but, nothing daunted, it went on diligently nibbling until it had made a hole large enough for its passage (Figs. 16, 17) and emerged for the first time into light and air. A short rest on the rush, to brush its body and limbs with the wonderful brushes and combs which are so artfully concealed on each limb, some used for brushing out the long cilia round the margins of the wings, and those on the front tibia, of semicircular form, specially contrived to fit the antennæ, which were brushed one at a time most carefully. A final shake of the exquisite wings and away flew the Fairy Fly on its virgin flight (Fig. 18), soon to find a partner, and then to search for the eggs of *Liburnia*, and another brood is started. In some genera (especially in that of *Anagrus*) the males are fairly common, but when scarce (and among some, the males are still unknown) the females are parthenogenetic, or, as in some instances, the males are apterous, and do not leave the host egg, copulation taking place before the females emerge from the host egg. I have frequently observed this in an allied species, *Prestwichia aquatica* (Lubbock), which oviposits in the eggs of the Large Water Beetle. Several times I have bred from thirty to forty from a single egg!

As might be expected from this little-known family of ovivorous parasites, many wonderful facts in their habits and economy are brought to light by constant research, and even then we feel how little we know about most of the genera, in many instances the only known facts being their date of capture and locality. Take, for instance, the genus *Gonatocerus*. Many times we have swept up twenty to

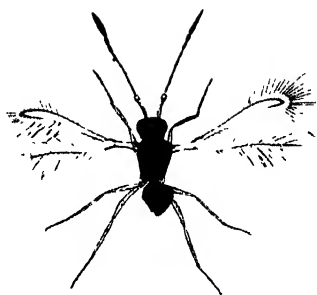


FIG. 9.—*CAMPIOPLEXA PAPAVERIS*
(One nineteenth of an inch long.)



FIG. 10.—FAIRY FLY CAUGHT IN A SPIDER'S WEB.

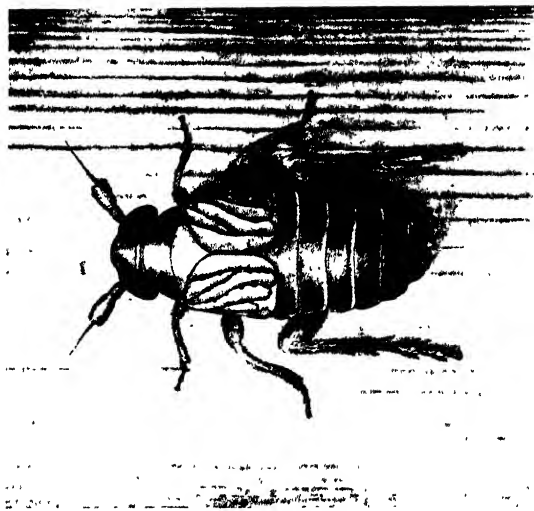


FIG. 11 — Frog Hopper (*Rhaphigaster*).



FIG. 12. —GERMS OR EGGS OF FAIRY FLY.



FIG. 13 —LARVÆ OF FAIRY FLIES
(Magnified 40 diams.)



FIG 14 —DEVELOPMENT OF IMAGO
IN HOST EGG

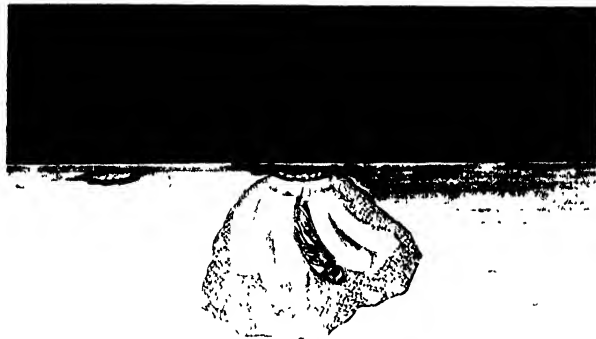


FIG 15 —FALKA FLY FULLY DEVELOPED
IN HOST EGG



FIG. 16 —FALKA FLY FORCING HIS WAY
THROUGH THE EGG

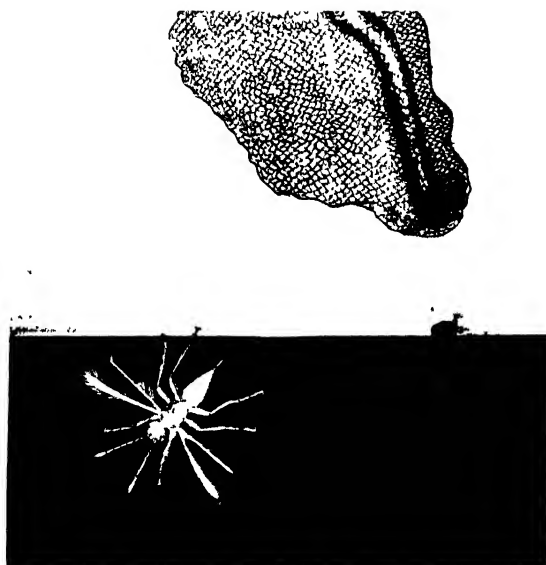


FIG. 16.—LARVA FLY SUSHI-LUGHI

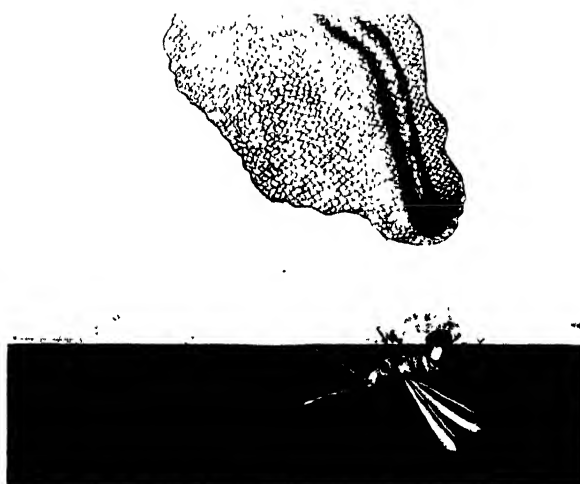


FIG. 17.—LARVA FLY EMERGING
FROM THE KUSHI

thirty specimens from a clump of rushes, and though so plentiful we have not yet discovered the host egg, though we have bred numerous specimens from various growing plants.

In my endeavour to trace out the life-histories of the Mymaridae, I have often placed all kinds of eggs before the living Fairy Flies. In one instance I tried the following experiment: I bred a number of Alapti from eggs of *Psocus fasciatus*, and, desiring to ascertain whether they would oviposit in eggs of other insects, I carefully gummed twenty eggs of different insects on to a rose-leaf, and at the extreme tip a single egg of *Psocus*. I then placed an Alaptus on the leaf; it ran about and touched the first egg with its antennæ and turned from it, then sounded the second and refused it, and so on; every one of the twenty eggs was refused. I then guided the Alaptus up the midrib; it ran along and reached the egg of *Psocus*, touched it and instantly mounted it, inserted its ovipositor and placed an egg into it. By some marvellous power it was able to recognize the right host egg. I have proved that Alaptus will not oviposit in any other species of egg.

Unfortunately, our knowledge of the value of parasitic insects is very small, and the question has often been asked of the writer, viz.: "What good are these minute Fairy Flies?"—and the remark has frequently followed: "They are too small to be of any service." Of course such questions are only asked by those who do not appreciate or take notice of "creeping things." I think one instance will suffice to prove that nothing has been created in vain, and that all insects perform the function for which they were intended.

Many times have I found patches containing hundreds of eggs of Cabbage Moth, every one of which has been destroyed by a minute Fairy Fly, *Trichogramma evanescens* which lays its eggs in those of the Cabbage Moth, and so lessens the chance of the caterpillars that would otherwise have been bred from the eggs. Surely the most ignorant and prejudiced individual will not deny that this tiny parasite should have the credit due to it.

REPORT ON METEOROLOGICAL OBSERVATIONS AT
WISLEY, 1913.

By R. H. CURTIS, Hon. F.R.H.S.

A SURVEY of the weather of the year 1913 as experienced over the United Kingdom as a whole offers a sharp contrast in some respects, and a striking resemblance in others, to that of the year which immediately preceded it. Both years began with mild and open weather, which continued throughout the first three months, with a marked absence of frost, and a very unusual forwardness in the growth of vegetation and the development of foliage; in both also there was a check later on, since when the warmer weather became due the temperature (as is shown by the temperature curve in fig. 19) fell considerably below its normal level, and so hindered the development of vegetation that the spring became more backward than usual. The cold spell was, however, less persistent in 1913 than in the earlier year, and the autumn months were warm and fine. As regards rainfall there was less resemblance between the two years; the summer of 1912 was not only cold but wet; that of 1913 was dry, and indeed the rainfall of the year as a whole was only normal. There were a few heavy falls of rain in various districts, due to thunderstorms, but nowhere was there anything even remotely analogous to the deluge which descended upon a part of East Anglia in the summer of 1912, and wrought such dire destruction to gardens and farms all over the county of Norfolk. The amount of bright sunshine experienced was also fairly large in the year now under review, whereas the earlier year was one of the most sunless on record. A most unusual phenomenon which distinguished 1913 was the persistence of relatively high temperatures up to within a few days of the close of the year, prolonging the flowering of many plants to an abnormal date, and inducing growths of buds, &c., many weeks earlier than they are usually looked for. Quite at the close of the year this unseasonable precocity was checked by a short spell of cold and the first touch of wintry weather. It was not severe, nor did it continue long, but it was welcome for the prospect it offered of more to follow, sufficient to give plants the rest they need between the active growth of the past summer and that which is to follow. The year now closed was not remarkable for gales, nor were there any serious falls of snow, or, with one exception, other meteorological phenomena of outstanding interest. The exception was a remarkable tornado, a fortunately rare phenomenon in this country, but unpleasantly frequent in some parts of America, which made its appearance over South Wales, and travelling up the Taff valley left behind it for many miles a narrow track of wreckage, comprising houses, trees, farms, and farmers' stock, and involving also some loss of life.

The chief climatic features of the year as shown by the observations made each day at the Meteorological Observatory in the Society's gardens at Wisley will be most easily gathered from the diagrams in fig. 19 to fig. 22. The first (fig. 19) shows the variations of the mean

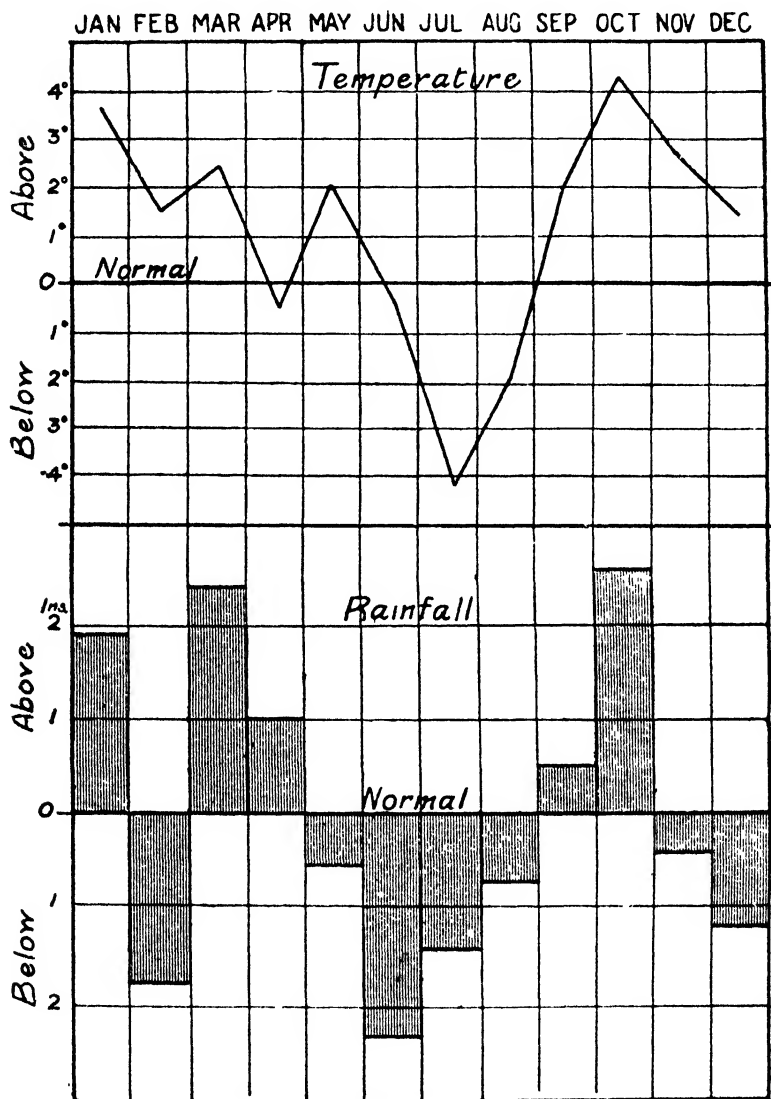


FIG. 19.—DIFFERENCES OF THE MONTHLY MEANS OF TEMPERATURE AND RAINFALL FROM THE AVERAGE.

temperature and of the rainfall from the normal ; and it will be noticed as regards the rainfall that there were only three months in which the average fall was much exceeded, and that for four consecutive months in the summer the amount which fell was below it ; the larger fall than

usual which came in October had become badly needed by the time it arrived. The warm spring and autumn, separated by the cool July and August, are shown by the diagram in the upper section of the figure.

Fig. 20 shows the relation between the temperature of the air and of the soil. In the corresponding diagram for 1912 (vol. xxxix., p. 48) the temperature rises steadily to a maximum in July and then as steadily decreases to the close of the year; the curves for 1913 exhibit a more normal progress of the phenomenon, the change between June and September being slight, indicating a greater duration of the warmth of summer both in the air and in the soil.

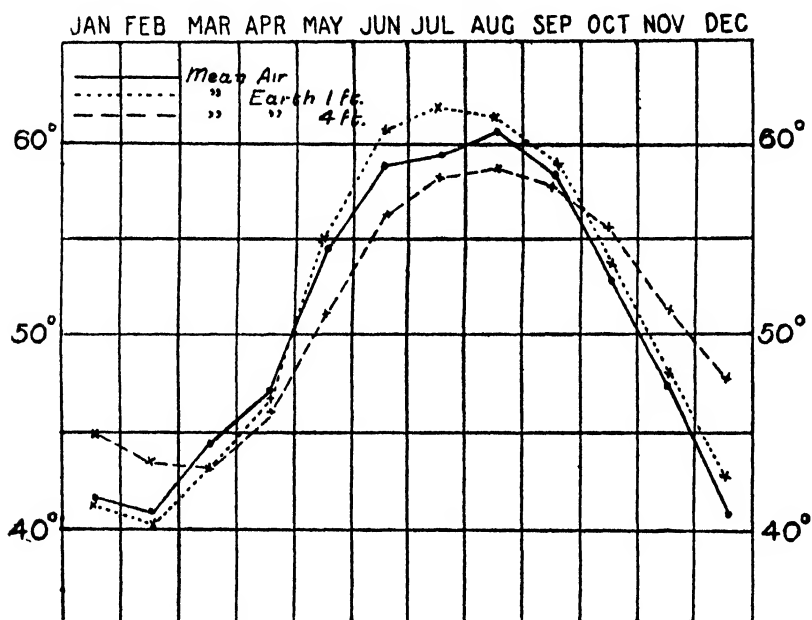


FIG. 20.—MEAN TEMPERATURE OF THE AIR, AND OF THE SOIL AT THE DEPTH OF ONE FOOT AND OF FOUR FEET BELOW THE SURFACE, FOR EACH MONTH.

In fig. 21 the predominance of winds from the south to west quadrant is shown, and by the shaded circle in the centre the relative frequency of calms.

Fig. 22 shows the mean daily range of temperature in the air, and also the difference between the mean minimum temperature of the air, as recorded in a closed screen four feet above the soil, and that registered by a thermometer laid upon the grass and fully exposed to the sky—conditions analogous to those experienced by plants growing in the open.

The observations for the several months are as follows :

January.—The year began with a continuation of the remarkably mild weather with which its predecessor had closed, and in nearly every part of the kingdom it remained comparatively warm and open

right through the first month. There were a few sharp night-frosts about the end of the second week, and the temperature on the ground fell several degrees below the freezing point, but the duration of the cold snap was altogether too short to check materially the abnormal forwardness of vegetation due to the exceptionally open character of the weather during the preceding two or three months. But at Wisley there was only one day throughout the month on which the temperature failed to reach 40° , and on six it exceeded 50° ; whilst, to go to quite the other extreme of the kingdom, so far north as Ross and Invernessshire, temperatures well above 50° were occasionally experienced. This unseasonable mildness was due to the predominance of southerly and westerly winds, accompanying the passage of centres of disturbed weather across the kingdom from west to east; and although as a rule these winds were not exceptionally strong they brought with them considerable quantities of rain, so that the month may be fairly, if alliteratively, described as warm, wet, and windy! The rainfall was everywhere in excess of the average with the exception of the north of Scotland, where in places it did not amount to so much as an inch, and was less than half the usual amount over a considerable area. But further south the fall exceeded the average, and in many districts the excess was considerably more than double the usual amount. With such a type of weather the amount of bright sunshine recorded was generally far less than the normal; the south-east of England was, however, an exception and received about its usual amount, whilst London and its suburbs were favoured with nearly 50 per cent. more than the average.

The results from the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	.	.	41'5°				
Highest " " " "	.	.	52°	on the	9th and 23rd		
Lowest " " " "	.	.	26°	"	13th and 14th		
Lowest " on the grass	.	.	20°	"	13th		
Number of nights of ground frost	.	.	.	.	.	13
					At depth of		
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	41'3°		42'1°	44'9°	
Highest " " " "	.	.	45°		44°	47°	
Lowest " " " "	.	.	38°		40°	44°	

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 94 per cent.

Rain fell on 18 days, to the total depth of 2'78 in. (equivalent to about 13 gallons of water to the square yard). Heaviest fall on any day 0'34 in., on the 11th and 22nd.

The prevailing winds were southerly.

The average velocity of the wind was $7\frac{1}{2}$ miles an hour.

There were $52\frac{1}{2}$ hours of bright sunshine, equal to 20 per cent. of the greatest possible amount.

There were 13 days on which no sunshine was recorded.

February.—The mean temperature of this month justified the adage that "as the days lengthen the cold strengthens," since the mean temperature was generally below that of January, although it

still kept rather above the usual level for the month. The most prevalent winds were southerly, and during the earlier part of the month they were strong and gusty, but relatively warm; then ensued a quieter period, during which scarcely any rain fell, except in the north of Scotland, where the weather continued wet throughout the month. With the setting in of this quiet weather, fog became generally prevalent for some days, and at times it was very dense. London and its immediate vicinity experienced a spell of "high fog," when a canopy of smoke hung for hours over the town, effectually cutting off the light of day and rendering artificial light as necessary as at night. The greater part of the country was, however, more fortunate, and although the vapour fog was not pleasant it was not harmful from the gardener's point of view. The highest temperature recorded at Wisley was 55 degrees, and there were very few places where this temperature was exceeded. The rainfall at Wisley amounted to only three-quarters of an inch, and of this amount two-thirds fell on three days. But except in the extreme north the rainfall was everywhere small, and over the greater part of England and the eastern parts of Scotland, and also over the greater part of Ireland, the total for the month was less than one inch. The month was not, however, a brilliant one, and at Wisley, as in nearly every part of the kingdom, the amount of bright sunshine recorded was less than the average, and in some districts the deficiency was very considerable.

The results from the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	.	.	.	.	40°·7°		
Highest	"	"	"	"	.	.	55°·4° on the 11th
Lowest	"	"	"	"	.	.	25° " 23rd
Lowest	"	on the grass	.	.	.	.	19° " 23rd
Number of nights of ground frost	.	.	.	.	.	.	15
At depth of							
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	40°·2°	41°·0°	43°·5°
Highest	"	"	"	"	.	.	44° 43° 45°
Lowest	"	"	"	"	.	.	37° 39° 42°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain fell on 10 days, to the total depth of 0·75 in. (equivalent to about 3½ gallons of water to the square yard). Heaviest fall on any day 0·21 in., on the 1st.

The prevailing winds were southerly.

The average velocity of the wind was 8 miles an hour.

There were 49 hours of bright sunshine, equal to 18 per cent. of the greatest possible amount.

There were 10 days on which no sunshine was recorded.

March.—The outstanding feature of the weather throughout this month was its unsettled character. The month began with a strong southerly gale, and rough boisterous weather in which the wind occasionally became exceptionally strong continued more or less right on to its close, although the last week was scarcely so rough as the earlier days had been. A gale which occurred on the 22nd

was noteworthy because of the havoc it wrought over the southern half of the kingdom, where its passage was marked by severe thunderstorms and very heavy rain. These unsettled conditions were due to the passage of a succession of centres of disturbance along a west to east path, which as a rule lay over the northern half of the kingdom ; and it was owing to this that the prevailing winds were from southerly and westerly points of the compass, with weather warmer than is usual in March, and a rainfall generally in excess of the average. At Wisley there were two or three sharp ground frosts, and on the night of the 17th the exposed thermometer laid upon the grass fell 16 degrees below the freezing point ; but on the other hand there were not many days when the screened thermometer did not rise in the day-time to above 50°, and there were only five nights in which it fell to freezing point or below.

In some parts of the kingdom the fall of rain was greatly in excess of the average ; everywhere it was so to some extent, but over some parts of the Midlands the fall was nearly three times as much as the usual amount. The amount of bright sunshine varied somewhat, some localities getting more and others less than the average ; but, as is not seldom the case when the rainfall is large, the amount of sunshine was, generally speaking, nearly normal, the differences from the average being small in either direction.

The records at Wisley show .

Mean temperature of the air in shade	.	.	.	.	44·4°		
Highest	"	"	"	"	57°	on the 6th	
Lowest	"	"	"	"	27°	"	25th
Lowest	"	on the grass	.	.	16°	"	18th
Number of nights of ground frost	.	.	.	.	.	.	11

						At depth of	
						1 ft.	2 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	43·2°	42·9°	43·9°
Highest	"	"	"	"	45°	44°	45°
Lowest	"	"	"	"	40°	41°	42°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain fell on 20 days, to the total depth of 2·66 in. (equivalent to about 12 gallons of water to the square yard). Heaviest fall on any day 0·36 in., on the 28th.

The prevailing winds were south-westerly.

The average velocity of the wind was 11 miles an hour.

There were 102 hours of bright sunshine, equal to 28 per cent. of the greatest possible amount.

There were 5 days on which no sunshine was recorded.

April.—With the opening of this month the character of the weather underwent for a time a change, and became somewhat more settled. During its earlier days it was generally dry but dull, and there was not a great deal of wind ; then followed another stormy period, gales succeeding each other in quick succession, with heavy falls of rain and occasional snow, which in some districts was heavy enough to cover the ground to depths of from three to six inches. The heaviest of these snowfalls occurred with a *southerly* wind, which,

however, was so cold that it produced the lowest temperature of the month! With the exception of this "cold snap" the temperature continued fairly uniform and close to the average throughout. The warmest days occurred towards the close, and on the 29th the screened thermometer at Wisley rose to 69 degrees, the daily range being as a rule small. The month was, however, a wet one, and over nearly the whole kingdom the fall of rain was above the average, in some parts exceeding it by more than 100 per cent.; the exception to this state of things was found in the extreme north-east, where the fall of rain was less than the average. Generally speaking the month was a dull one, very few districts receiving its usual quota of sunshine, and some usually sunny parts—the southern counties and the Channel Islands—getting little more than half their usual amount of sun. The unusual warmth of the 29th was followed in the evening by a thunderstorm of rare magnificence, in which the lightning-flashes succeeded each other with startling rapidity.

The records at Wisley show:

Mean temperature of the air in shade	.	.	.	.	47° 0'	
Highest	"	"	"	"	69°	on the 29th
Lowest	"	"	"	"	27°	" 13th
Lowest	"	on the grass	.	.	22°	" 13th
Number of nights of ground frost	.	.	.	.	.	7
						At depth of
				1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	46° 8'	46° 1'	46°
Highest	"	"	"	54°	51°	48°
Lowest	"	"	"	42°	44°	45°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 79 per cent.

Rain fell on 18 days, to the total depth of 2·15 in. (equivalent to about 10 gallons of water to the square yard). Heaviest fall on any day 0·41 in., on the 29th.

The prevailing winds were south-westerly.

The average velocity of the wind was 9 miles an hour.

There were 124 hours of bright sunshine, equal to 30 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

May.—Throughout the opening days of the month the weather was unsettled and breezy, but for some time the wind did not rise to the force of a gale, and then it was only over the northern portion of the kingdom that it became very strong. Its changeableness was, however, a marked feature of the weather right through the month, and thunderstorms, with heavy rain and occasionally hail, were not infrequent. The commencement of one of these storms, which occurred over Surrey and south-east England on the 27th, was accompanied by a sudden drop of 13° in temperature, and by hailstones of phenomenal size. The earlier days of the month were unusually cool, the thermometer at Wisley failing to rise so high as 60° for the first ten days, whilst slight ground-frosts occurred on two or three nights; but during the closing week both the days and nights were unusually warm, the maximum on the 26th exceeding 80° at Wisley and rising to nearly 80° daily from the 25th to the 30th. Generally

the fall of rain was in excess of the average, but at Wisley and indeed over the greater part of south-eastern England it was below it, and in some districts the fall did not amount to an inch. Conversely, whilst the amount of bright sunshine experienced in most parts of the kingdom was below the normal, in the south-east it was slightly above it, Wisley having an average of 7 hours per day and London $6\frac{1}{2}$ hours.

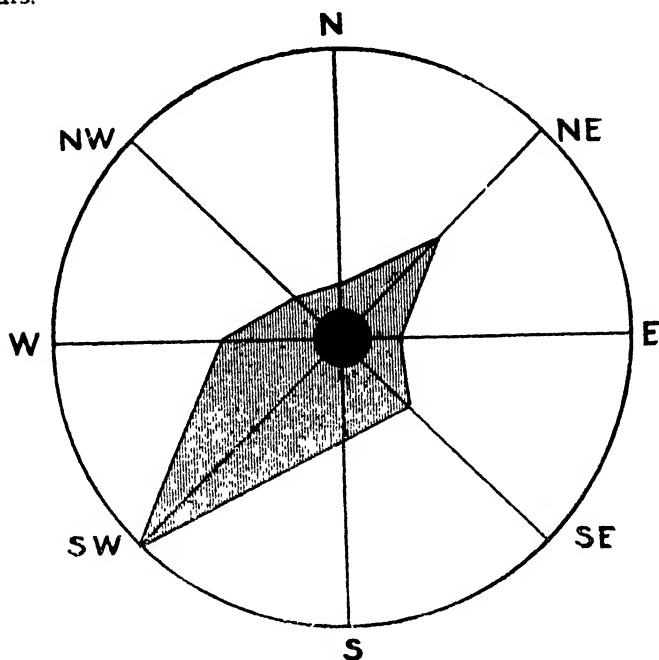


FIG. 21.—DISTRIBUTION OF WINDS DURING THE YEAR. THE RELATIVE FREQUENCY OF CALMS IS SHOWN BY THE SHADED CIRCLE IN THE CENTRE.

The Wisley records give :

Mean temperature of the air in shade	.	.	.	.	.	54°5'		
Highest	"	"	"	"	"	80°	on the 26th	
Lowest	"	"	"	"	"	35°	"	7th
Lowest	"	"	"	"	on the grass	28°	"	7th
Number of nights of ground frost	.	.	.	.	.	.	.	5
							At depth of	
Mean temperature of the soil at 9 A.M.	.	.	.	.	.	1 ft. 54°9'	2 ft. 52°8'	4 ft. 50°8'
Highest	"	"	"	"	"	62°	59°	55°
Lowest	"	"	"	"	"	50°	49°	48°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 75 per cent.

Rain fell on 10 days, to the total depth of 1·68 in. (equivalent to about $7\frac{1}{4}$ gallons of water to the square yard). Heaviest fall on any day 0·61 in., on the 29th.

The prevailing winds were southerly.

The average velocity of the wind was 6 miles an hour.

There were 219 hours of bright sunshine, equal to 46 per cent. of the greatest possible amount.

There were 3 days on which no sunshine was recorded.

June.—This was a very dry month in all parts of the kingdom, except the highland districts of the western seaboard, and it was also fairly sunny. There were a few strong winds, but they affected chiefly the western districts, as the centres of disturbance to which they were due travelled along tracks well to the north-west of our islands, and therefore over the greater part of the kingdom it was a month of fine, dry weather. In many parts of England less than half an inch of rain fell; and over the country generally, excepting only the north-western littoral, the fall did not exceed an inch. Over Wales, Ireland, and Scotland it was larger, but still abnormally small. At Wisley bright sunshine was recorded every day, and to the amount of 14 hours on three occasions, but at several places the records were less than this and somewhat below the normal June amount. There were again several severe thunderstorms, and in some of them damage was done to trees and to cattle. The mean temperature was rather above the average over the eastern parts of the kingdom, and somewhat below it in the west. There were a few very hot days in the middle of the month, when the thermometer rose to 84° at Wisley, and again during the last three days, when the maximum reached 78° ; but all through the month the nights were warm, and there were no ground frosts.

The Wisley records give :

Mean temperature of the air in shade	.	.	.	.	58.7°			
Highest " " " "	.	.	.	.	84°	on the 16th		
Lowest " " " "	.	.	.	.	40°	" 1st		
Lowest " on the grass	.	.	.	.	30°	" 1st		
Number of nights of ground frost	.	.	.	.	.	.	.	1

						At depth of		
						1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	60.4°	58.3°	56.0°	
Highest " " " "	.	.	.	.	64°	60°	58°	
Lowest " " " "	.	.	.	.	57°	57°	55°	

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 72 per cent.

Rain fell on 6 days, to the total depth of 0.62 in. (equivalent to about 3 gallons of water to the square yard). Heaviest fall on any day 0.34 in., on the 20th.

The prevailing winds were south-westerly and westerly.

The average velocity of the wind was 6 miles an hour.

There were 219 hours of bright sunshine, equal to 45 per cent. of the greatest possible amount.

There were no days on which sunshine was not recorded.

July.—This was an exceptionally cool and dull month, and also an unusually dry one. Scarcely anywhere did the thermometer rise to 80° , and in some places it did not reach 70° , but over the country generally the daily maxima ranged between 60° and 70° , with correspondingly low night minima, and the monthly mean temperature was therefore well below the average. The rainfall was altogether abnormal, and large areas of the kingdom were subject to a drought which would have been far more severely felt had the temperature been normally high. There were, however, again some thunderstorms of exceptional severity, and one which passed over Sussex on the night

of the 14th brought with it a fall of nearly 4 inches of rain, "the rain appearing like a continuous sheet of falling water"; at Wisley the fall on this occasion was nearly three-quarters of an inch. But, taking the kingdom as a whole, it was only in those places which thunderstorms had visited that the fall of rain approximated to the normal,

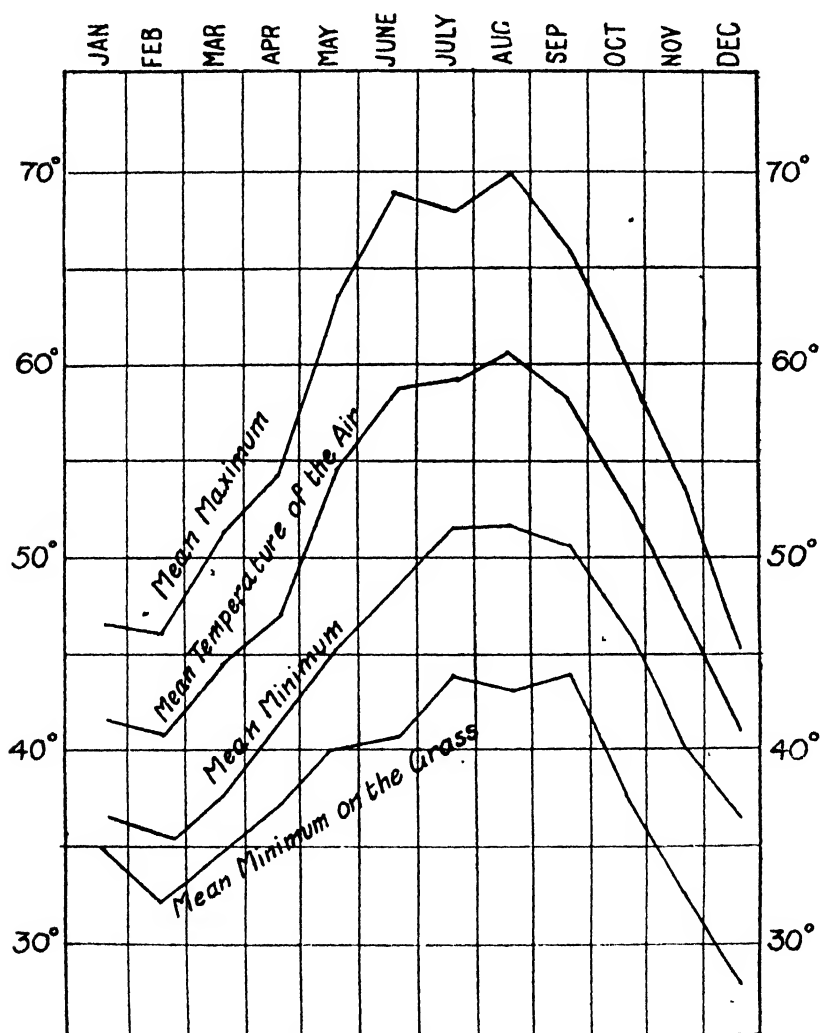


FIG. 22.—MEAN TEMPERATURE OF THE AIR; MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURE OF THE AIR; MEAN MINIMUM TEMPERATURE ON THE GRASS, FOR EACH MONTH.

and many parts of the west which are usually amongst the wettest had total falls of less than half an inch. To complete the description of this unseasonable month it only remains to add that its sunlessness was as remarkable as its lack of rain; a few places in the north and west received more than their average amount of sunshine, but the

country generally, and the south-eastern counties of England in particular, had far less, some parts of the latter district getting an average of less than three hours a day.

The results from the Wisley records are as follows :

Mean temperature of the air in shade	.	.	.	.	59°3'		
Highest	"	"	"	"	75°	on the	29th
Lowest	"	"	"	"	43°	"	8th
Lowest	"	on the grass	.	.	32°	"	8th
Number of nights of ground frost	.	.	.	.	.	.	1

					At depth of		
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	61°5'	60°3'	57°9'
Highest	"	"	"	"	65°	61°	58°
Lowest	"	"	"	"	60°	59°	58°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 80 per cent.

Rain fell on 11 days, to the total depth of 1·70 in. (equivalent to about 8 gallons of water to the square yard). Heaviest fall on any day 0·72 in., on the 14th.

The prevailing winds were northerly.

The average velocity of the wind was 4 miles an hour.

There were 120 hours of bright sunshine, equal to 24 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

August.—This was another very dry month, and also a cool one, with less than the average amount of bright sunshine over the greater part of the kingdom, the exception being Ireland and a part of the north western coasts, where the record of sunshine exceeded the average. It was, however, a quiet month as regards wind, and there were no unusual phenomena of interest to note. At Wisley the temperature rarely rose above 70°, and only once—and that near the close of the month—did it reach 80°. At night the temperature upon the ground several times fell perilously near to the freezing point, and once it actually touched it; but in the screen, four feet above the ground, the lowest point reached was 40°. Rainfall was even less abundant than in July, and the totals, such as they were, were largely due to exceptional downpours accompanying thunderstorms; but in many districts there was an entire absence of rain for periods of thirty days or thereabout, from July on to well towards the close of August, and whilst in few districts did the total fall amount to so much as two inches, in many it was less than an inch. Winds from northerly points of the compass were unusually prevalent throughout the month.

The Wisley records show :

Mean temperature of the air in shade	.	.	.	.	60°5'		
Highest	"	"	"	"	81°	on the	28th
Lowest	"	"	"	"	41°	"	26th
Lowest	"	on the grass	.	.	32°	"	26th
Number of nights of ground frost	.	.	.	.	.	.	1

					At depth of		
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	61°1'	60°5'	58°5'
Highest	"	"	"	"	63°	61°	59°
Lowest	"	"	"	"	60°	60°	58°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 76 per cent.

Rain fell on 9 days, to the total depth of 1·44 in. (equivalent to about 6½ gallons of water to the square yard). Heaviest fall on any day 0·79 in., on the 31st.

The prevailing winds were north-easterly, and south-westerly.

The average velocity of the wind was 4 miles an hour.

There were 143 hours of bright sunshine, equal to 32 per cent. of the greatest possible amount.

There were 2 days on which no sunshine was recorded.

September.—After the opening days of this month a welcome change took place in the character of the weather, and the winds, getting round to more easterly and southerly points, brought with them a more seasonable state of things, with the result that the mean temperature for the month was rather above the average, instead of being below it, as in so many previous months. It was also a quiet month, without strong winds; but the drought was broken, and although some localities still continued to get less than their normal rainfall, the greater part of the kingdom had no cause for complaint in that direction, and several districts had considerably more rain than usual. But the weather was still rather dull, and bright sunshine was less prevalent than is usual in September; a few places, London being one of them, were favoured with rather more than the normal amount, but some parts of the south-west did not receive much more than half the usual quota.

The records at Wisley give the following results:

Mean temperature of the air in shade	.	.	.	.	53·2°			
Highest	"	"	"	"	.	.	.	76° on the 27th
Lowest	"	"	"	"	.	.	.	40° " 10th
Lowest	"	"	on the grass	.	.	.	.	30° " 10th
Number of nights of ground frost	.	.	.	.	.	.	.	1
At depth of								
					1 ft.	2 ft.	4 ft.	
Mean temperature of the soil at 9 A.M.	.	.	.	.	58·3°	58·7°	57·8°	
Highest	"	"	"	"	.	.	.	61° 61° 59°
Lowest	"	"	"	"	.	.	.	56° 57° 57°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 87 per cent.

Rain fell on 11 days, to the total depth of 2·25 in. (equivalent to about 10½ gallons of water to the square yard). Heaviest fall on any day 1·02 in., on the 1st.

The prevailing winds were south-easterly.

The average velocity of the wind was 4 miles an hour.

There were 138 hours of bright sunshine, equal to 37 per cent. of the greatest possible amount.

There were 3 days on which no sunshine was recorded.

October.—With the advent of October a somewhat different type of weather set in—unsettled, mild, and with frequent and heavy falls of rain. Winds from some southerly point were the most frequent, and the air was unusually soft and mild—indeed, the unusual warmth was the distinctive feature of the month; there was practically no cold weather, and at Wisley the daily maxima ranged between 53°

on the 11th and 67° on the 2nd, but there were several readings above 60° quite at the close of the month. There were also very few ground frosts at night, and none of them severe. With such genial weather it was not surprising to hear from all parts of the kingdom of the persistence in bloom of various herbaceous plants and of roses, of second crops of plums and raspberries, and also of the blooming of lilac, primroses, and other spring flowers. There were a good many severe thunderstorms, and heavy falls of rain in various parts of the kingdom, the downpour being in some instances phenomenally heavy—between 2 and 3 inches in the course of the day and night. Wisley had rain on 15 days, but in some districts scarcely a day passed without rain—much or little. Notwithstanding the heavy rainfall, the amount of bright sunshine was very generally in excess of the average, and nowhere was it much below the normal; at Wisley it averaged three hours and a quarter per diem. A meteorological phenomenon which deserves mention was the tornado which visited South Wales at the close of the 27th, and in its course destroyed a considerable amount of property besides several lives.

The records at Wisley give the following results:

Mean temperature of the air in shade	.	.	.	.	52·8°		
Highest	"	"	"	"	.	67°	on the 2nd
Lowest	"	"	"	"	.	35°	" 25th
Lowest	"	on the grass	.	.	.	27°	" 24th
Number of nights of ground frost	.	.	.	.	.	.	7
At depth of							
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	53·7°	54·8°	55·3°
Highest	"	"	"	"	.	59°	59°
Lowest	"	"	"	"	.	49°	52°
							53°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain fell on 15 days, to the total depth of 3·51 in. (equivalent to about 16½ gallons of water to the square yard).

Heaviest fall on any day 0·71 in., on the 26th.

The prevailing winds were from south-east to south-west.

The average velocity of the wind was 4 miles an hour.

There were 104 hours of bright sunshine, equal to 32 per cent. of the greatest possible amount.

There were 5 days on which no sunshine was recorded.

November.—The outstanding feature of the weather throughout this month was its remarkable mildness, due to the persistent southerly winds, which occasionally attained considerable force, but were invariably warm for the season. Snow was entirely absent, but rain was somewhat frequent, although not heavy; and in many districts night frosts were never experienced. At Wisley on calm nights the thermometer exposed upon the grass occasionally fell below 32°, and once to 20°, but few districts had a similar experience, and at Wisley the day temperature rose to above 50° nearly every day throughout the month. Everywhere, therefore, the mean temperature exceeded the normal, and again a remarkable prolongation of activity in plant life was

recorded. At Wisley dahlias were cut by frost on the night of the 9th; but roses flowered throughout the month, and in some districts wallflowers, primroses, and even strawberries did so also. The rainfall along the eastern coasts of England and Scotland failed to reach the monthly average, and in some districts—Wisley being one—the number of days of rain was moderate; but on the other hand many districts had rain nearly every day, and the normal amount was considerably exceeded. In the extreme west the amount of sunshine was less than the normal for November, but generally speaking the number of hours recorded largely exceeded the average, in some districts by 50 per cent.

The records from Wisley show :

Mean temperature of the air in shade	.	.	.	.	47°	
Highest	"	"	"	"	59°	on the 11th
Lowest	"	"	"	"	26°	" 23rd
Lowest	"	on the grass	.	.	20°	" 23rd
Number of nights of ground frost	.	.	.	.	.	16

					At depth of	
					1 ft.	2 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	47.8°	49.5°
Highest	"	"	"	"	51°	52°
Lowest	"	"	"	"	43°	47°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 90 per cent.

Rain fell on 12 days, to the total depth of 2.17 in. (equivalent to about 10 gallons of water to the square yard).

Heaviest fall on any day 0.60 in., on the 21st.

The prevailing winds were south-westerly.

The average velocity of the wind was 7 miles per hour.

There were 81 hours of bright sunshine, equal to 31 per cent. of the greatest possible amount.

There were 5 days on which no sunshine was recorded.

December.—The abnormal features of this autumn were continued into the closing month of the year, and relatively high temperatures were again noticeable throughout. Cold intervals were, however, more frequent, and more generally experienced, than hitherto, and night frosts were not uncommon and occasionally were severe; at Wisley the lowest point reached by the thermometer laid upon the grass was 14°, but in the north it fell still lower. The openness of the season was, however, still testified to by the activity of vegetation reported from various districts:—an “abnormally large ripe wild strawberry” picked on the roadside in Worcestershire; “roses, violets, and various spring flowers” gathered in Surrey; “blackberries in full bloom” in the Isle of Wight, and so on. The month closed with colder weather, but till then the general level of temperature had been above the normal throughout. The month was a dry one except at a few normally wet spots in the north-west; and although there were a good many districts which were exceptions, yet, generally speaking, it was also a bright month, the amount of bright sunshine recorded being in many parts largely in excess of the normal.

The records made at Wisley show :

Mean temperature of the air in shade	.	.	.	.	40°8'	
Highest	"	"	"	"	54°	on the 9th
Lowest	"	"	"	"	27°	" 22nd
Lowest	"	on the grass	.	.	14°	
Number of nights of ground frost	.	.	.	.	.	19

					At depth of		
					1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	.	.	.	.	42°6'	44°9'	47°4'
Highest	"	"	"	"	48°	49°	49°
Lowest	"	"	"	"	36°	40°	44°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 91 per cent.

Rain fell on 13 days, to the total depth of 1·11 in. (equivalent to about 5 gallons of water to the square yard).

Heaviest fall on any day 0·48 in., on the 23rd.

The prevailing winds were south-westerly.

The average velocity of the wind was 7 miles an hour.

There were 44 hours of bright sunshine, equal to 18 per cent. of the greatest possible amount.

There were 17 days on which no sunshine was recorded.

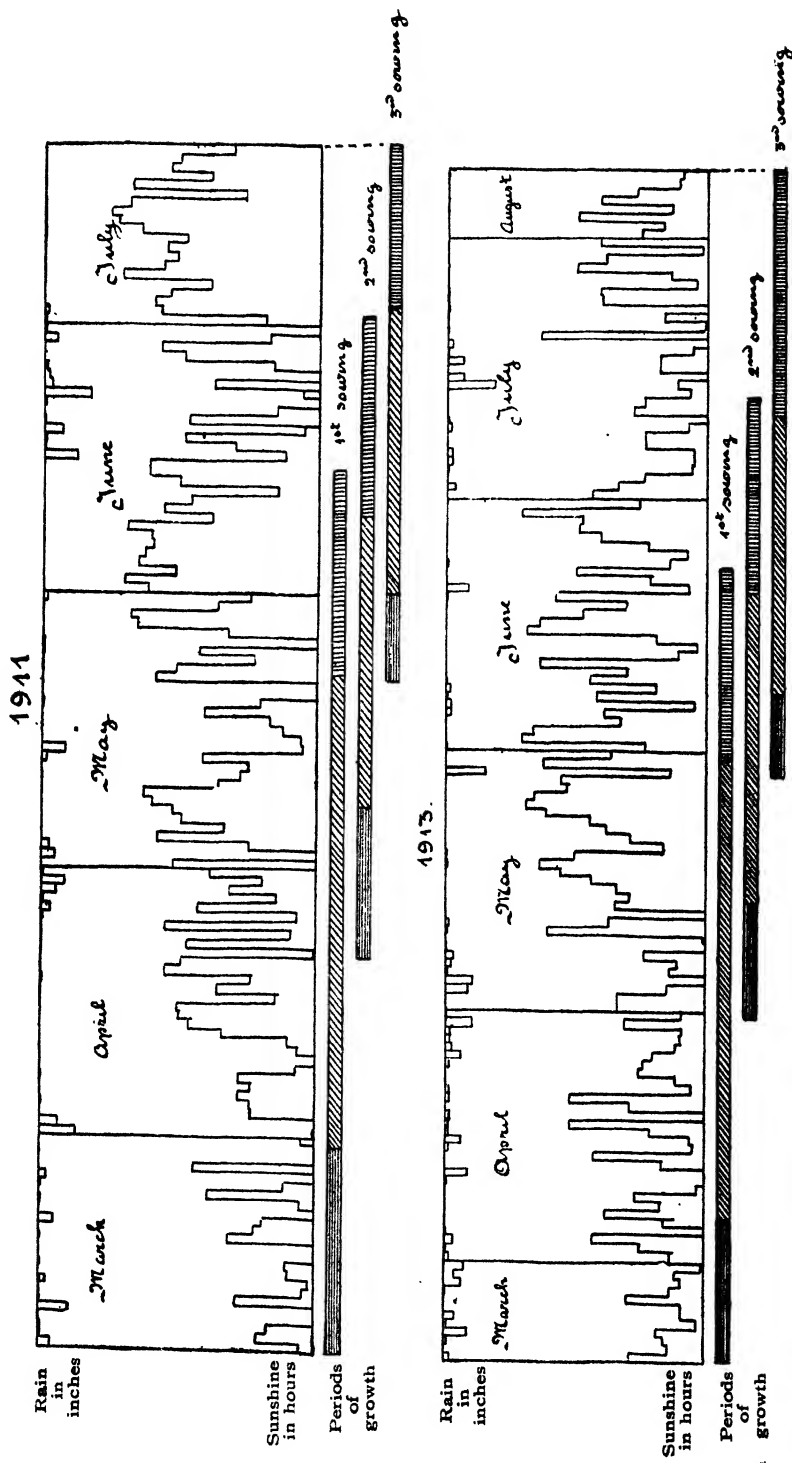


FIG. 23.—COMPARATIVE DIAGRAMS FOR THE AVERAGES OF 38 SIMILAR STOCKS OF THE TRIALS OF 1911 AND 1913, SHOWING AVERAGE PERIODS OF GROWTH, DAYS AND HOURS OF SUNSHINE, AND INCHES OF RAIN.

[To face p. 65.]

AN ANALYSIS OF THE PEA TRIALS AT WISLEY, 1913.*

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THE general arrangements of this second series of trials were the same as those for the year 1911, the chief difference being that later dates were selected for the three sowings.

The total number of stocks was 217, representing 188 varieties (29 being duplicates). The results of the sowing of these duplicates have been separately observed, and not, as was the case in 1911, grouped together in one series of figures. The results, therefore, have been included in the calculation of the averages. Out of the 217 stocks, 105 are available for averages—that is to say, they gave complete results for the three sowings; 112 stocks failed to give complete results, or about 52 per cent. of failures, as compared with 45 per cent. in 1911. These 105 stocks included 43 stocks or varieties which were not tried in 1911. There are, however, 38 similar stocks which gave full results, and these have been tabulated and averaged for the sake of comparison.

The 105 stocks are subdivided into the same classification used in the previous analysis, namely:—

80-90-day Peas represented by 0 stocks				
91-100	„	„	72	„
101-110	„	„	31	„
over 111	„	„	2	„

Before dealing with the details of examination of the analysis, it may be well to compare the dates of sowing:—

1911		1913		Number of days later than in 1911
Date	Interval	Date	Interval	
March 8		March 20		12
April 21	44	April 30	41	9
May 22	31	May 29	29	7

In Table I. the 105 stocks have been tabulated and subdivided into the above classification, giving the intervals in days between the four stages of growth, as well as the total number of days between sowing and "ready to pick" (p. 68).

* Data taken from R.H.S. JOURNAL, vols. xxxvii. pp. 403-424; xxxviii. pp. 67-72; xxxix. pp. 674-701.

Table II. gives the averages and the maximum and minimum for the same periods (p. 71).

Table III. gives the same information with regard to the 38 stocks common to both the trials of 1911 and 1913 (p. 72).

Table IV. shows the sunshine and rain records for the period of growth during the year 1913 (p. 74).

Table V. is a comparative table of the averages of the 38 stocks common to both trials, as well as the total amount of rain and sunshine during the different stages of growth (p. 75).

As previously noted, the acceleration of germination during the three sowings is marked ; the average periods compare as follows :—

GERMINATION PERIOD.

Sowing	91-100-day Peas		101-110-day Peas		Over 111-day Peas	
	1911	1913	1911	1913	1911	1913
1	25½	16½	26½	17¾	27¾	17
2	15½	14½	17½	14	18	15
3	9½	9½	9½	9½	10	9

One curious and unexpected fact is at once noticeable : namely, that although there was an average acceleration of about nine days in germination, not a single stock fell into the 80-90-day Pea class of 1911, in spite of the fact that similar stocks were tried. This is true of the whole 217 stocks.

A slight acceleration of germination occurs in the second sowing, of about two days.

The third sowing remains constant.

This thus appears to prove that the germination and its acceleration up to a certain limit depend solely on the increasing warmth of the soil under normal climatic conditions.

The interval for the production of the first flower again shows marked fluctuations ; the comparison of average results is as follows :—

FLOWERING PERIOD.

Sowing	91-100-day Peas		101-110-day Peas		Over 111-day Peas	
	1911	1913	1911	1913	1911	1913
1	53½	53½	55½	62½	58½	73
2	31	32½	33½	44½	33½	49
3	28	31½	32½	42½	36½	52

It will be seen that in the last two classes the results for the two years are scarcely comparable, and on examination of the averages for the ready-to-pick period the same fluctuations are just as marked, namely :—

READY-TO-PICK PERIOD.

Sowing	91-100-day Peas		101-110-day Peas		Over 111-day Peas	
	1911	1913	1911	1913	1911	1913
1	18½	23¼	24½	25½	29	28½
2	20½	22½	24½	25½	28½	39½
3	19½	29½	18	28½	17½	25½

Again making the same comparisons as in the previous analysis, it will be found that the interval between "above ground" and "first flower" was longer in the *third* sowing than in the second:—

in the case of 91-100-day Peas 9 times, or 12½ per cent.

101-110 " " 9 " " 29 "

over 111 " " 2 " " 100 "

that the interval between "first flower" and "ready to pick" was longer in the *second* sowing than in either the first or third sowing:—

in the case of 91-100-day Peas 9 times, or 12½ per cent.

101-110 " " 6 " " 19½ "

over 111 " " 2 " " 100 "

and that the interval between "first flower" and "ready to pick" was longer in the *third* sowing than either the first or second sowing:—

in the case of 90-100 day Peas 58 times, or 81 per cent.

101-110 " " 14 " " 45 "

over 111 " " 0 " " 0 "

These percentages compare favourably with those of the previous trials, except in the case of the interval between "first flower" and "ready to pick" in the third sowing as compared with that of the first or second sowing.

For the examination of the climatic influences Tables III., IV., and V. have been calculated. The summary in the last five columns of Table V. is interesting, showing as it does the similarity of the abnormal conditions of the years 1911 and 1913. The failure of the third sowings in both cases may be justly attributed to the excess of sunshine, and to the fact that Peas require more rain for their cropping with certainty.

In conclusion, it is evident, in order to obtain more certain and clearer facts on the rate of growth and the development of crops, repeated trials would have to be made. Whether it would be advisable, and whether the results would repay the trouble, the author must leave to the Society to decide. Undoubtedly the conclusion drawn from the first trials is confirmed—namely, that it is obviously the period of fructification which requires shortening in order to bring the late Peas safely to fruit independently of the climatic conditions. It does seem to point to a repetition at some future date, so that a normal condition of climate may be examined in comparison with the three periods of growth.

TABLE I.

NUMBER OF DAYS BETWEEN THE INTERVALS OF "SOWING," "ABOVE GROUND," "FIRST SIX FLOWERS," AND "READY TO PICK," AS WELL AS THE TOTAL NUMBER OF DAYS BETWEEN "SOWING" AND "READY TO PICK."

First sowing took place on March 20, second sowing April 30, and third sowing May 29.

Sowing	No. of stock	No. of days between			Total days	Sowing	No. of stock	No. of days between			Total days	Sowing	No. of stock	No. of days between			Total days
		Above ground	First 6 flowers	Ready to pick				Above ground	First 6 flowers	Ready to pick				Above ground	First 6 flowers	Ready to pick	
1	1	18	53	24	95	1	48	15	53	23	91	1	69	13	55	23	91
2		15	32	41	88	2		13	31	20	64	2		15	29	21	65
3		11	31	28	70	3		9	27	32	68	3		11	25	32	68
1	2	18	53	20	91	1	49	18	50	27	95	1	78†	15	54	23	92
2		15	32	17	64	2		14	30	21	65	2		13	31	21	65
3		11	28	29	68	3		9	30	37	76	3		11	31	34	76
1	3	26	53	17	96	1	50	16	55	21	92	1	79†	16	52	23	91
2		15	40	22	77	2		13	36	19	68	2		15	29	22	66
3		11	36	29	76	3		12	32	27	71	3		11	28	37	76
1	11	15	53	23	91	1	51*	18	36	41	95	1	80	16	55	25	96
2		15	29	21	65	2		15	34	19	68	2		15	34	28	77
3		9	27	32	68	3		9	41	21	71	3		11	28	37	76
1	15	15	56	21	92	1	52*	20	51	24	95	1	81	18	50	27	95
2		15	32	17	64	2		15	34	30	79	2		13	29	24	66
3		9	30	32	71	3		11	33	27	71	3		11	31	24	71
1	16	15	55	21	91	1	56	16	53	23	92	1	83	16	52	20	98
2		15	32	18	65	2		13	34	18	65	2		13	41	43	97
3		11	28	29	68	3		11	31	26	68	3		11	37	28	76
1	22	16	53	22	91	1	60	15	56	21	92	1	88	18	54	26	98
2		15	32	19	66	2		13	31	20	64	2		13	41	25	79
3		9	30	29	68	3		9	27	35	71	3		9	39	28	76
1	28	16	60	22	98	1	61	18	51	26	95	1	90	18	51	22	91
2		15	39	23	77	2		15	29	20	64	2		16	31	18	65
3		9	39	20	68	3		9	33	34	76	3		11	31	29	71
1	29	16	51	24	91	1	63	18	60	17	95	1	92	16	52	23	91
2		15	29	20	64	2		15	39	17	71	2		13	31	21	65
3		9	27	35	71	3		9	41	26	76	3		11	31	29	71
1	40	15	53	23	91	1	64	16	51	24	91	1	94	15	53	23	91
2		15	29	21	65	2		14	28	23	65	2		15	29	21	65
3		9	27	27	63	3		9	27	32	68	3		9	27	32	68
1	43	16	53	22	91	1	66	16	55	25	96	1	99‡	15	56	24	95
2		13	31	20	64	2		13	36	17	66	2		15	34	17	66
3		9	30	29	68	3		9	33	26	68	3		9	35	27	71
1	47	15	52	24	91	1	67	15	54	22	91	1	100‡	18	53	24	95
2		13	29	22	64	2		15	29	21	65	2		15	34	26	65
3		9	27	26	62	3		9	27	35	71	3		11	33	24	68

* Both stocks variety 'English Wonder,' but from different firms.

† Both stocks variety 'Gradus,' but from different firms.

‡ Three stocks variety 'Little Marvel,' but from different firms.

Sowing	No. of stock	No. of days between				Sowing	No. of stock	No. of days between				Sowing	No. of stock	No. of days between			
		Above ground	First 6 flowers	Ready to pick	Total days			Above ground	First 6 flowers	Ready to pick	Total days			Above ground	First 6 flowers	Ready to pick	Total days
1	102*	15	56	24	95	1	146	13	54	24	91	1	194	15	52	24	91
2		13	36	27	66	2		15	29	20	64	2		13	31	21	65
3		11	33	24	68	3		9	27	32	68	3		9	27	32	68
1	109	15	63	20	98	1	159	15	52	24	91	1	195	18	63	17	98
2		15	42	22	79	2		15	49	26	90	2		15	42	33	90
3		9	11	26	76	3		11	49	19	79	3		9	49	24	82
1	110	15	57	24	96	1	163	19	52	24	95	1	196	15	52	24	91
2		15	34	28	77	2		13	34	21	68	2		15	27	22	64
3		9	33	34	76	3		11	33	24	68	3		9	27	26	62
1	111	15	52	25	92	1	165	16	52	27	95	1	197	18	50	27	95
2		15	29	24	68	2		15	29	24	65	2		13	29	26	68
3		9	27	32	68	3		9	27	35	71	3		11	25	32	68
1	113†	16	53	26	95	1	167	18	60	20	98	1	200	15	56	21	92
2		15	32	18	65	2		13	41	25	79	2		13	36	30	79
3		9	32	30	71	3		9	41	26	76	3		8	34	29	71
1	114†	18	53	21	92	1	170	16	51	25	92	1	203	18	54	23	95
2		15	32	21	68	2		13	31	21	65	2		15	34	32	81
3		8	31	29	71	3		9	27	32	68			9	35	24	68
1	118	18	54	23	95	1	173‡	16	52	23	91	1	206	16	62	18	96
2		13	36	22	71	2		13	31	20	64	2		15	34	28	77
3		11	33	24	68	3		9	27	40	76	3		9	30	29	68
1	131	18	51	26	95	1	174‡	15	52	24	91	1	150	15	53	23	91
2		15	32	21	68	2		15	29	21	65	2		15	27	22	64
3		9	35	27	71	3		9	27	40	76	3		9	27	32	68
1	132	13	51	24	91	1	175‡	16	52	24	91	1	9	18	58	29	105
2		15	29	20	64	2		15	29	21	65	2		15	39	26	80
3		9	27	32	68	3		9	27	40	76	3		9	39	28	76
1	133	20	51	20	91	1	178	16	58	18	92	1	18	16	62	27	105
2		15	36	17	68	2		15	29	21	65	2		15	39	23	77
3		9	33	34	76	3		11	25	32	68	3		8	42	31	81
1	135	18	50	23	91	1	180§	15	52	24	91	1	21	18	64	24	106
2		13	29	22	64	2		15	29	20	64	2		15	49	33	97
3		9	27	35	71	3		9	27	32	68	3		9	51	28	88
1	140	16	62	20	98	1	181§	15	52	25	92	1	25	15	64	26	105
2		13	41	23	77	2		13	31	20	64	2		15	39	25	79
3		9	41	21	71	3		9	27	35	71	3		9	41	26	76
1	141	18	61	19	98	1	184	15	52	24	91	1	30	19	62	24	105
2		13	41	25	79	2		13	31	20	64	2		15	42	25	82
3		9	39	28	76	3		8	28	25	61	3		12	42	22	76
1	143	16	52	23	91	1	190	16	51	24	91	1	34	18	64	23	105
2		13	31	21	65	2		15	27	22	64	2		15	42	27	84
3		11	25	32	68	3		11	31	29	71	3		9	44	28	81

* Three stocks variety 'Little Marvel,' but from different firms (see ante).

† Both stocks variety 'Marvellous,' but from different firms.

‡ Three stocks variety 'Pilot,' but from different firms.

§ Both stocks variety 'Vanguard,' but from different firms.

Sowing	No. of stock	No. of days between			Total days	Sowing	No. of stock	No. of days between			Total days	Sowing	No. of stock	No. of days between			Total days
		Above ground	First 6 flowers	Ready to pick				Above ground	First 6 flowers	Ready to pick				Above ground	First 6 flowers	Ready to pick	
1	35	18	64	23	105	1	116	19	66	21	106	1	156	20	63	24	107
2		15	42	27	84	2		13	51	33	97	2		13	51	27	91
3		9	44	28	81	3		11	44	27	82	3		11	50	22	83
1	38	16	62	27	105	1	122	18	65	26	109	1	166	16	66	23	105
2		13	51	33	97	2		13	51	26	90	2		15	42	22	79
3		11	39	41	91	3		9	51	22	82	3		9	41	26	76
1	55	18	61	26	105	1	124	18	64	27	109	1	168	15	57	33	105
2		13	42	24	79	2		15	49	18	82	2		13	36	24	73
3		9	44	23	76	3		9	51	23	83	3		9	33	29	71
1	57	16	62	27	105	1	112	18	64	24	106	1	171	18	60	27	105
2		15	39	25	79	2		13	51	20	84	2		15	42	27	84
3		11	39	32	82	3		9	27	46	82	3		9	46	27	82
1	62	18	65	22	105	1	127	14	65	26	105	1	179	15	63	27	105
2		15	50	19	84	2		15	49	18	82	2		15	40	29	84
3		9	46	27	82	3		9	44	29	82	3		9	41	26	76
1	65	16	62	27	105	1	113	19	62	25	106	1	205	19	53	35	107
2		13	36	28	77	2		13	44	29	86	2		13	36	33	82
3		11	33	24	68	3		9	41	41	91	3		11	33	32	76
1	86	18	55	32	105	1	134	18	63	24	105	1	106	18	70	18	106
2		15	35	29	79	2		16	35	26	77	2		14	50	33	97
3		11	42	23	76	3		12	41	23	76	3		11	50	23	84
1	87	19	63	23	105	1	215	23	59	24	106	1	7*	16	74	24	114
2		15	49	20	84	2		13	52	19	84	2		15	49	43	107
3		9	46	27	82	3		9	44	29	82	3		9	52	31	92
1	211	18	64	34	106	1	155	18	67	21	106	1	8*	18	72	33	123
2		13	52	24	89	2		13	52	26	91	2		15	49	36	100
3		9	44	29	82	3		9	42	31	82	3		9	52	20	81

* Both stocks variety 'Autocrat,' but from different firms.

TABLE II.

MAXIMUM AND MINIMUM AVERAGE INTERVALS AS WELL AS TOTAL AVERAGE INTERVAL BETWEEN "SOWING," "ABOVE GROUND," "FIRST SIX FLOWERS," AND "READY TO PICK."

Sowing	Above Ground			First Six Flowers			Ready to Pick			Total Days
	Max.	Min.	Average	Max.	Min.	Average	Max.	Min.	Average	
91-100-day Peas (72 stocks)										
1	26	13	16½	63	36	53½	41	17	23½	93
2	15	13	14½	49	27	32½	43	17	22½	69½
3	11	8	9½	49	25	31½	40	19	29½	60½
101-110-day Peas (31 stocks)										
1	23	11	17½	70	55	62½	31	18	25½	96
2	16	13	14½	51	35	44½	33	18	25½	84½
3	12	8	9½	51	33	42½	46	22	28½	80½
Over 111-day Peas (2 stocks)										
1	18	16	17	74	72	73	33	24	28½	118½
2	15	15	15	49	49	49	43	36	39½	103½
3	9	9	9	52	52	52	31	20	25½	86½

TABLE III.—COMPARATIVE TABLE
OF THE NUMBER OF DAYS BETWEEN THE INTERVALS OF "SOWING," "ABOVE GROUND," "FIRST FLOWER," AND "READY TO PICK," AS WELL AS
THE TOTAL NUMBER OF DAYS BETWEEN "SOWING" AND "READY TO PICK" FOR 38 SIMILAR STOCKS USED IN THE TRIALS OF 1911 AND 1913.

1911					1913					1911					1913						
Sowing		No. of days between			Name of Stock and Reference Number	No. of days between			Sowing	No. of days between			Name of Stock and Reference Number	No. of days between			Sowing	No. of days between			
		Above ground	First flowers	Ready to pick		Above ground	First flowers	Ready to pick		Above ground	First flowers	Ready to pick		Above ground	First flowers	Ready to pick					
1	29	50	20	99	2	18	53	24	95	1	26	52	20	98	51	'Giant Lightning', (Carter)	1	13	55	23	91
2	17	31	28	76	1	15	32	41	88	2	14	34	20	68			2	15	29	21	65
3	16	30	18	58	3	11	31	28	70	3	10	25	21	56			3	11	25	32	68
1	26	56	16	98	3	11	31	28	70	1	26	52	25	103	59	'Gradus', (Sydenham) (Dobbie)	1	15	54	23	92
2	19	29	28	76	2	15	32	17	64	2	17	30	15	71			2	13	31	21	65
3	10	32	16	58	3	11	28	20	68	3	11	29	18	57			3	11	31	34	76
1	26	59	25	110	9	18	58	29	105	1	23	61	19	103	61	'Harvestman', (Carter)	1	16	62	20	98
2	17	35	24	76	2	15	39	26	80	2	19	36	22	77			2	13	41	43	97
3	10	37	18	65	3	9	39	28	76	3	9	40	16	65			3	11	37	28	76
1	26	56	15	97	12	15	56	21	92	1	27	52	31	110	68	'James Holmes', (Holmes)	1	18	51	22	91
2	13	36	17	66	1	15	32	17	64	2	15	33	22	70			2	16	31	18	65
3	10	29	24	63	3	9	30	32	71	3	10	30	16	56			3	11	31	29	71
1	23	56	26	105	18	16	53	22	91	1	23	55	25	103	71	'King of Dwarfs', (Sutton)	1	16	52	23	91
2	15	33	27	67	2	15	32	19	66	2	19	29	19	67			2	13	31	21	65
3	10	29	20	59	3	9	30	29	68	3	10	27	19	56			3	11	31	29	71
1	26	61	33	120	23	15	64	26	105	1	26	56	21	103	79-80	'99-100 Little Marvel', (Burr and Carter)	1	17	54	24	95
2	20	33	82	82	2	15	30	25	70	2	17	31	21	69			2	15	34	27	66
3	11	38	16	65	3	9	41	26	76	3	11	33	14	58			3	10	34	26	70
1	26	58	19	103	24	16	60	22	98	1	26	56	16	98	90	'Mayflower', (Carter)	1	18	54	23	95
2	15	37	27	77	2	15	39	23	77	2	21	28	31	80			2	13	36	22	71
3	11	36	13	60	3	9	39	20	68	3	11	31	19	61			3	11	33	24	68
1	30	55	27	112	29	16	62	27	105	1	26	61	26	113	97	'127 Peerless', (Sutton)	1	14	65	26	105
2	15	38	24	77	2	13	51	33	97	2	19	40	25	84			2	15	49	18	82
3	9	37	17	63	3	11	39	41	91	3	10	41	15	66			3	9	44	29	82

1	26	52	25	103	33	'Early Dwarf', (Sutton)	43	1	16	53	22	91	1	26	53	19	98	100	'Pioneer', (Sutton)	133	1	20	51	20	91
2	19	30	21	70				2	13	31	20	64	2	17	31	21	69				2	15	36	17	88
3	9	31	19	59				3	9	30	29	68	3	11	25	19	53				3	9	33	34	76
1	26	52	19	97	36	'Eclipse', (Sutton)	47	1	15	52	24	91	1	27	57	19	103	163	'Premier', (Mack and Miln) (Bell and Bieberted)	134	1	18	63	24	105
2	11	37	18	66				2	13	29	22	64	2	15	39	22	76				2	16	35	26	77
3	9	26	21	56				3	9	27	26	62	3	9	36	18	63				3	12	41	23	76
1	26	52	27	105	37	'Eight Weeks', (Carter)	48	1	15	53	23	91	1	24	54	14	92	104	'Primus', (Barr)	135	1	18	50	23	91
2	11	37	18	66				2	13	31	20	64	2	17	31	21	58				2	13	29	22	64
3	9	27	20	56				3	9	27	32	68	3	9	28	21	58				3	9	27	35	71
1	23	56	19	93	43	'Empress of India', (Sutton)	50	1	16	55	21	92	1	26	60	25	111	110	'Quite Content', (Carter)	141	1	18	61	19	98
2	15	33	20	68				2	13	36	19	68	2	19	37	20	76				2	13	41	25	79
3	11	31	18	60				3	12	32	27	71	3	11	38	16	65				3	9	39	28	76
1	26	57	28	111	44	'English Wonder', (Sutton)	52	1	20	51	24	95	1	25	52	21	99	113	'Reading Wonder', (Sutton)	143	1	16	52	23	91
2	20	28	28	76				2	15	34	30	79	2	17	31	18	66				2	13	31	21	65
3	11	34	13	58				3	11	33	27	71	3	10	30	16	56				3	11	25	32	68
1	27	63	22	112	38	'Evergreen Delicatesse', (Carter)	55	1	18	61	26	105	1	26	56	18	100	115	'Ringleader', (Sutton)	146	1	13	54	24	91
2	17	35	28	80				2	13	42	24	79	2	13	35	21	99				2	15	29	20	64
3	9	41	15	65				3	9	44	23	76	3	9	33	16	58				3	9	27	32	68
1	26	52	25	103	40	'Excelsior', (Sutton)	56	1	16	53	23	92	1	26	62	37	115	122	'Superb', (Laxton)	163	1	19	52	24	95
2	17	31	21	69				2	13	34	18	65	2	19	29	20	68				2	13	34	21	68
3	9	20	18	56				3	11	31	26	68	3	10	32	17	59				3	11	33	24	68
1	26	58	26	110	39	'Exhibition', (Carter)	57	1	16	62	27	105	1	26	52	19	97	132	'Talisman', (Sharpe)	165	1	16	52	27	95
2	19	33	28	80				2	15	39	25	79	2	14	34	18	66				2	15	29	24	68
3	10	36	17	63				3	11	39	32	82	3	9	26	21	56				3	9	27	35	71
1	23	55	12	90	42	'Exonian', (R. Veitch)	60	1	15	56	21	92	1	26	58	26	110	133	'Telephone', (Sutton)	167	1	13	60	20	98
2	15	33	20	68				2	13	31	20	64	2	19	34	24	77				2	13	41	25	79
3	9	26	21	56				3	9	27	35	71	3	10	27	16	63				3	9	41	26	76
1	26	60	25	111	47	'Fillbasket', (Sutton)	65	1	18	60	17	95	1	26	52	19	97	146	'The Pilot', 173-5 (Sutton, Carter, Dickson, Dobbie)	173-5	1	16	52	23	91
2	15	38	27	80				2	15	39	17	71	2	14	34	18	66				2	14	30	21	65
3	9	38	18	65				3	9	41	26	76	3	9	27	22	58				3	9	27	37	73
1	23	55	19	97	48	'First of All', (Sutton)	64	1	16	51	24	91	1	26	52	19	97	155	'Victor', (J. Veitch)	184	1	15	52	24	91
2	17	31	18	66				2	14	28	23	65	2	22	46	25	73				2	13	31	20	64
3	10	20	20	56				3	9	27	32	68	3	10	28	21	59				3	8	28	25	61

TABLE IV.

SUNSHINE AND RAIN RECORDS FOR THE PERIOD OF TRIALS IN 1913.

—	MARCH		APRIL		MAY		JUNE		JULY		AUGUST	
Day of Month	Hrs. of Sun-shine	Rainfall in inches	Hrs. of Sun-shine	Rainfall in inches	Hrs. of Sun-shine	Rainfall in inches	Hrs. of Sun-shine	Rainfall in inches	Hrs. of Sun-shine	Rainfall in inches	Hrs. of Sun-shine	Rainfall in inches
1	—	—	2·8	·08	6·8	—	4·7	trace	8·8	—	5·1	—
2	—	—	5·0	·01	6·8	—	14·1	—	6·7	·12	3·4	—
3	—	—	8·7	·11	3·0	·34	13·4	—	4·8	—	10·0	—
4	—	—	—	trace	—	·41	6·6	—	1·1	trace	2·8	—
5	—	—	3·1	—	2·7	—	7·9	·09	1·0	·07	8·3	—
6	—	—	7·7	—	2·2	·01	·8	·09	1·0	·07	5·5	—
7	—	—	3·4	—	4·9	·08	8·5	·01	4·7	—	2·2	—
8	—	—	5·4	trace	—	·11	3·9	·07	4·8	—	2·0	—
9	—	—	·5	trace	·2	·01	8·0	trace	1·5	·06	·9	—
10	—	—	—	·03	12·2	—	6·2	—	—	·03	9·5	·06
11	—	—	—	·37	7·5	·01	12·7	—	5·7	—	2·8	—
12	—	—	3·4	—	—	·05	2·2	—	4·8	—	2·0	—
13	—	—	8·7	—	7·0	—	·6	—	1·4	—	·1	·01
14	—	—	·8	·06	5·9	—	3·8	—	2·4	·72	2·4	·04
15	—	—	1·2	·26	6·9	—	13·9	—	—	·25	—	—
16	—	—	4·4	·06	8·8	—	12·8	—	3·7	—	4·2	—
17	—	—	10·5	·05	11·1	—	9·5	—	3·7	·26	10·0	—
18	—	—	—	·07	12·8	—	6·1	—	1·1	trace	2·4	—
19	—	—	5·7	—	10·1	·05	11·6	trace	—	·09	·3	—
20	5·7	·30	10·5	·05	3·2	trace	1·4	·34	12·8	—	6·2	—
21	2·8	·16	1·0	·04	5·7	—	4·4	—	·3	·01	10·4	—
22	3·2	·28	2·2	—	7·6	—	10·0	—	3·3	trace	1·1	·14
23	3·7	trace	10·3	—	8·9	—	2·9	·02	—	·02	5·9	·09
24	·5	—	9·9	·04	12·4	—	1·5	—	8·1	—	9·0	—
25	1·7	—	4·1	·25	13·9	—	4·5	—	8·2	trace	12·4	—
26	1·7	·18	2·3	·10	13·3	—	8·2	—	·9	trace	8·0	·04
27	6·0	·06	1·9	·07	10·7	—	9·8	—	2·7	—	3·0	—
28	2·7	·36	1·7	·09	11·2	—	9·5	—	10·1	—	9·3	—
29	1·8	·04	6·3	·41	2·8	·61	14·2	—	7·9	—	·2	·12
30	2·3	—	1·8	trace	12·6	—	5·2	—	·4	—	3·3	·15
31	·2	·08	—	—	7·4	—	—	—	8·3	—	—	·79
	32·3	1·42	123·3	2·15	218·6	1·68	218·9	·62	120·2	1·70	142·7	1·44

TABLE V.—COMPARATIVE TABLE
FOR THE AVERAGES OF 38 SIMILAR STOCKS OF THE TRIALS IN 1911 AND 1913 GIVING AVERAGE PERIODS OF GROWTH, DAYS AND
HOURS OF SUNSHINE AND DAYS AND INCHES OF RAIN.

Sowings	Period to First Leaf					Period to Flower					Period to Picking					Total Number of				
	Total days			Sun		Rain *					Total days			Sun		Rain *				
	Days	Hours	Inches	Days	Hours	Days	Inches	Days	Hours	Days	Hours	Days	Inches	Days	Hours	Days	Hours	Days	Hours	Inches
1911																				
First sowing	23	15	537.7	15	128	53	47	292.5	20	235	23	18	223.2	4	0.10	99	90	569.4	39	3.73
Second "	17	16	106.8	8	107	33	30	259.4	8	0.52	22	19	130.9	13	2.03	72	65	497.1	29	3.62
Third "	10	9	80.6	4	0.10	32	29	260.9	14	2.08	18	18	198.1	—	—	60	56	539.6	18	2.18
1913																				
First sowing	17	16	51.9	13	162	55	49	354.9	29	3.63	23	23	170.5	8	0.60	95	88	577.3	50	5.85
Second "	14	11	61.0	9	102	37	37	305.7	10	0.92	23	22	100.7	8	0.71	72	71	467.4	27	2.65
Third "	10	10	78.8	5	0.80	33	32	107.3	11	0.78	29	26	125.1	10	1.35	72	68	401.2	26	2.93

* A trace of rain is counted as a rainy day.

A CABBAGE DISEASE.

By W. B. GROVE, M.A.

A LONG-KNOWN disease of various cultivated forms of *Brassica*—Cabbage, Cauliflower, Broccoli, &c.—has been prevalent in the Isle of Wight, Cornwall, and elsewhere during the past winter. Its perfect stage is known as *Mycosphaerella brassicicola* C. & De Not., but it is somewhat rarely that the mature stage of the fungus is found. More commonly it abounds and does considerable damage in the imperfect or pycnidial stage, as indeed is the wont of many of the parasitic fungi belonging to the Ascomycetes.

The leaves begin to fade and are seen to be covered with numerous crowded circular spots of a pale brownish colour, surrounded by a green border and varying in size from about one-tenth to nearly half an inch across. The surface of these spots is dotted over with minute black points, arranged more or less in circular rings on the brownish area. When these are fully developed, the spots look grey, as if they had been sprinkled with a finely divided spray of ink.

This imperfect stage was described many years ago as *Asteroma Brassicae* Chev., but it is not an *Asteroma* in the modern sense, having no "fibres" surrounding the pycnidia, as was recognized by Berkeley when he first described it as British in 1841. Rather it should be classed as a *Phyllosticta*, although in its early stages it seems at times to come rather under the head of *Gloeosporium*, since the pycnidial envelope is then very delicate and somewhat imperfect. As there is already a *Phyllosticta Brassicae* Westd., having spores of a very different character and a different arrangement of the pycnidia, the present imperfect form will be named *P. brassicicola*, with the following description:

Spots scattered all over the leaf, very numerous, more or less orbicular, and marked with concentric circular lines, pallid, about 5–6 mm. in diameter on the average, and at length fuscous in the middle and surrounded by a greenish zone. Pycnidia very minute, delicate, globose, sometimes imperfect, arranged (often concentrically) in the centre of the spot, under the microscope translucent-olivaceous, opening by a minute pore. Spores cylindrical, straight or occasionally slightly curved, obtuse at the ends, frequently biguttulate, $4-5 \times 1-1\frac{1}{2} \mu$.

On the same spots, later, appear a large number of black perithecia belonging to the *Mycosphaerella*. So far as we know, no culture-experiments have been performed with this fungus, and the genetic connexion of the two forms is a mere presumption, although a very obvious and indubitable one. The perithecia of the *Mycosphaerella* are of a loosely cellular dark-olivaceous texture, which is conspicuously

thickened and darker round the ostiole. For a long time these contain nothing but imperfect asci filled, except at the summit, with dense protoplasm crammed with oily granules. But later a few will be found in which spores are evidently being formed, and ultimately mature asci, with spores which will readily quit the ascus on the application of pressure, will be discovered. These spores are for a long time simple (as BERKELEY and COOKE found them), but at length uniseptate, hyaline, between oblong and cylindrical, obtuse at both ends, but somewhat thicker in the upper than in the lower half, *i.e.* tending to become clavate, and measuring $17-20 \times 3-4 \mu$. The asci are broadly clavate when young, and more or less cylindric-oblong when mature. There are no paraphyses mingled with them, and the spores are usually arranged in a double or even in a treble row.

The *Mycosphaerella* (which was formerly called *Sphaerella*) has

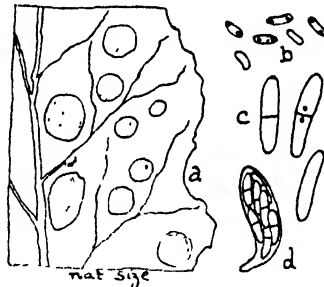


FIG. 24.—MYCOSPHAERELLA BRASSICICOLA, *a*, piece of affected cabbage leaf; *b*, the PHYLLOSTICTA spores; *c*, the ascospores; *d*, a mature ascus. [*b* and *c*, $\times 600$.]

been met with in various parts of the country, but seems to be more usually found on *old* or *dead* cabbage leaves. The pycnidial stage is a true parasite, attacking the living leaves with great virulence, and by destroying a great part of the chlorophyllose tissue it weakens its victim and renders it useless. A *Mycosphaerella* much resembling the present one is common everywhere upon the Broad-leaved Dock, *Rumex obtusifolius*. This also does its work chiefly in the imperfect stage, but the latter is not pycnidial, as in *Mycosphaerella brassicicola*, but conidial, and produces its spores quite superficially on the under side of the leaves. The small pale round spots, surrounded by a purple border, which it causes on the Dock leaves, are familiar, and the fungus in this stage was called *Ovularia obliqua*, or, still earlier, *Peronospora obliqua*. Later the Dock leaves are covered with similar darker, but unbordered, spots, densely dotted over with the little black perithecia of *Mycosphaerella Rumicis*. It is probable that both these species (and the allied ones which cause spots upon leaves) would be better classed under the genus *Stigmatea*.

No suggestion is known of any remedy for this disease; there are few remedies, if any, that would not cost more to apply than the benefit which would be derived from them could repay.

QUERCUS SEMECARPIFOLIA SMITH.

By R. A. DÜMMER, F.R.H.S.

MANY years have elapsed since LOUDON suggested the advisability of the introduction of this Himalayan Oak, sometimes called the Brown or Kharshu Oak, but it is only within recent years that the efforts of Mr. J. S. GAMBLE, the well-known Indian forester and botanist, have been successful in the raising of two plants, which are flourishing in his garden at East Liss, Hants. These specimens, the only two in the British Isles, were raised from acorns received from Chakatra, in the North-west Himalaya, 9000 feet above sea level, in 1900. The acorns, packed in charcoal dust, on arrival were sown immediately. Two of the resultant seedlings were 10 and 15 feet high respectively in 1909, and, having a slightly sheltered position, have withstood the idiosyncrasies of this climate admirably up to now. (Figs. 25, 26.)

The sub-evergreen character of this Oak, in conjunction with its holly-like appearance, invites for it a more extended cultivation, though in the more rigorous parts of the Kingdom difficulty will, no doubt, be experienced in its cultivation.

Quercus semecarpifolia, known also as *Q. obtusifolia* and *Q. Cassura*, is a native of the Himalayas, where from Kumaon to Bhutan and Munnipur it is rather gregarious, affecting altitudes of 6000 to 12,000 feet; it extends, however, north-eastwards to the mountains of China, in the provinces of Szechwan and Yunnan. Under very propitious circumstances it attains to a height of 100 feet and an 18-feet girth of trunk. The current year's shoots are angular, purplish or chestnut-brown in colour, and sparingly stellately pubescent. Leaves, holly-like, almost sessile, falling a month or two before the new leaves appear, at maturity leathery, greyish-green, variable in size and margin, usually elliptical in outline, about 3 inches long and 2 inches broad (rarely 6 inches by 4 inches), rounded or spine-tipped at the apex, cordate or rarely rounded at the base, with scattered deciduous stellate pubescence and sunken nerves above, paler and equally pubescent below, the midrib and its six to ten pairs of lateral nerves prominently raised, the latter forking towards the strongly wavy and spinous margin. The solitary or paired fruits ripen in the second year, and are borne on short stout pubescent peduncles, the acorns being globose or ovoid and enclosed at the base in the hemispherical cupule, about $\frac{1}{2}$ inch in diameter, which is covered with closely appressed tomentose scales. The wood, weighing 54 lb. to the cubic foot, is utilized locally for building purposes, door-frames, bedsteads, ploughs, and mule-saddles; it is very hard, close-grained, of fairly good quality, with a silvery though not very marked grain, but unfortunately is inclined to split in seasoning. The sapwood is greyish-white, the heartwood light pinkish-brown.

QUERCUS CRASSIPES—A MEXICAN OAK.

By R. A. DÜMMER, F.R.H.S.

THIS Mexican Oak was discovered by the illustrious HUMBOLDT near Santa Rosa and Ario, in Southern Mexico, at elevations of 6,000–8,000 feet above sea level, where, as a small tree about 20 feet high, with smooth greyish bark, it constitutes a member of the xerophilous vegetation which occurs there. On his return to Europe, HUMBOLDT, in conjunction with BONPLAND, described this species in 1813; but it was twenty-six years before its introduction to British horticulture was assured, when, in the Chiswick Garden of the Horticultural Society, plants were raised from acorns collected by HARIWEG (one of the Society's collectors) near Real del Monte. The latter also detected this rarity among Mexican Oaks at Tlalpugahua, and subsequently BOURGEOIS had the good fortune to stumble across it in the Valley of Mexico.

Despite its distinctiveness, this Oak has been somewhat misunderstood by even that great botanist BENTHAM, who confounded it with the true Mexican Oak, *Quercus mexicana*; and, curiously, that careful French savant GAY was also misled in regarding it as the *Quercus confertifolia*, another of the Mexican oaks.

Though the seedlings alluded to were eventually distributed by the Society to its members with no sparing hand, only one appears to have survived the vicissitudes of the English climate, and that a fine specimen in the grounds of Captain TREMAYNE at Carclew, Cornwall, which is now 65 feet high, with a trunk-girth 5 feet from the ground of 5 feet 5 inches. (Figs. 27, 28.) Its leaves fall in winter, but are apt to persist for two years, and are clustered towards the extremities of the twigs, being subtended by short stalks scarcely exceeding one-sixth of an inch, and often even less. The current year's twigs are roughly angled, dirty brown in colour, and are covered, like the stalks, the midrib, and the lower leaf-surfaces with stellate hairs plainly visible under a slight magnification. The leaf-blade is narrowly oblong in general outline, blunt or with a slight awn-like bristle at the apex, slightly rounded or obsoletely heart-shaped at the base, the margin being faintly wavy and destitute of any teeth. The leaves are firm and thinly leathery in consistency, and with age the stellate hairs disappear from their upper greyish green surfaces, though they invariably persist on the sunken midrib, and especially so on the opposing ochre-green side, which is moreover prominently net-veined, with its 10–19 paired lateral veins and their attendant ramifications. From the head gardener I glean that he

has never observed acorns on this specimen, despite its size; but whether innate individual sterility or effects of frost are accountable for this deficiency, only closer observation can decide.

On the Continent this Oak is as rare as it is here, for ELWES and HENRY have only recognized a small tree in M. ALLARD's Arboretum at Angers, which had been mistaken for *Quercus crassifolia*; prior to that it was cultivated in LEROY's nursery at the same town in 1847.

EUPHORBIA HISLOPII.

By R. A. DÜMMER, F.R.H.S.

THIS acquisition to the succulent Euphorbias of English collections is due to the enterprise of Mr. A. HISLOP, who presented Kew in 1911 with cuttings brought from the Botanic Gardens of Durban, Natal.

The species' origin, however, is unknown, but is surmised by Mr. N. E. BROWN, the author of the above name, to be Madagascar, or one of the neighbouring isles, as its nearest ally, *E. splendens*, is of Mascarene origin. Though the floral bracts of *E. Hislopii* partake of the vivid vermilion tint of those of its congener, and thus merit its cultivation, nevertheless the stems of the former, which are double the thickness of *E. Bozerei*, its sessile basally rounded leaves, and shorter peduncles render its recognition fairly easy.

A succulent, spinous, glabrous shrub. Stems eight-angled, olive-green, or greyish olive-green with a touch of madder brown, $\frac{3}{4}$ to 1 inch in thickness exclusive of the spines, the angles rounded and markedly spinously toothed, the spines $\frac{1}{2}$ to $\frac{3}{4}$ inch long, patent or directed downwards, and with the colour of the axis. Leaves deciduous, terminal, sessile, ascending or spreading with age, narrowly oblong or oblong-lanceolate, acute and apiculate, rounded basally, 2 to 2½ inches long, $\frac{3}{8}$ to $\frac{1}{2}$ inch broad, thin, fresh green, the margin entire and with a suspicion of a crimson tint. The cymes are borne at the apices of the twigs, usually solitary or in pairs, and erect, the stout greenish peduncles averaging 1 inch long, with scale-like membranous oblong or almost quadrate and very blunt bracts scarcely exceeding $\frac{1}{10}$ inch long. The floral bracts are transversely elliptic, rounded and minutely apiculate, $\frac{1}{2}$ inch long and $\frac{3}{10}$ inch broad, and of a beautiful vermilion colour. The bell-shaped involucre is also furnished with five transversely elliptic reddish glands. The included ovary is shortly stalked and is terminated by the equally reddish thread-like styles, which are club-shaped and dark brown at their apices.

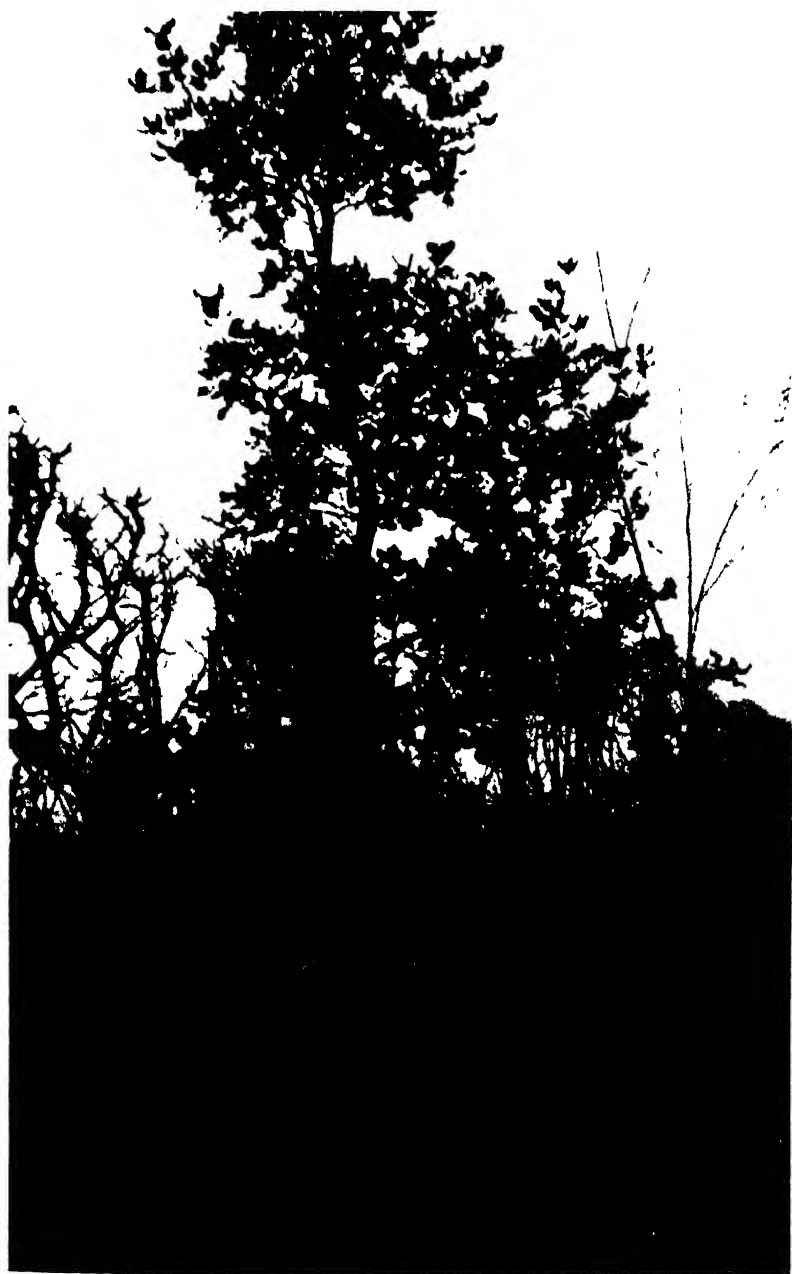


FIG. 25. *QUERCUS SEMICARPIFOLIA* AT EAST LISS, HANTS

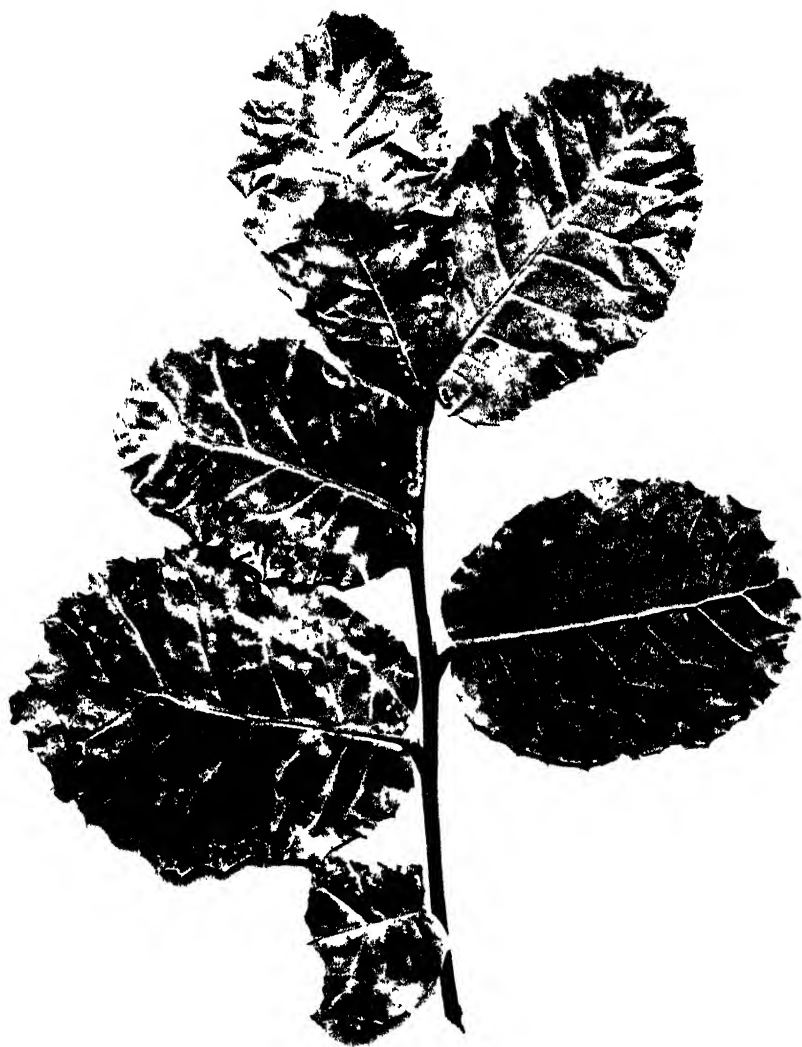


FIG. 26 - *QUERCUS SIMICARPIFOLIA*

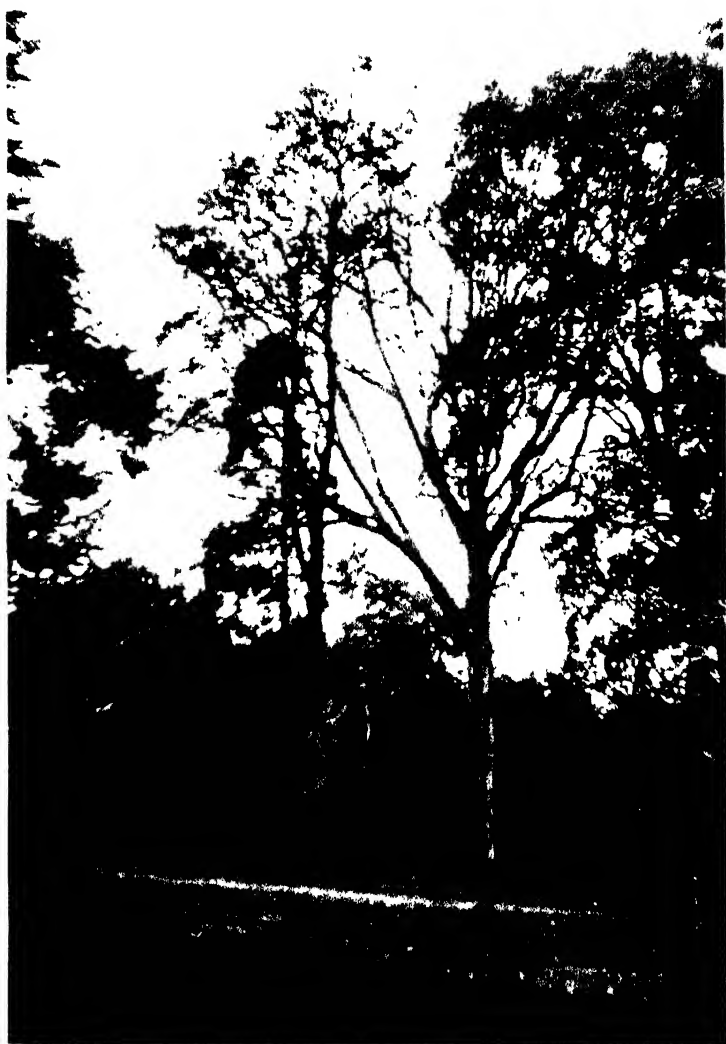


FIG. 27. —*QUERCUS CRASSIPES* AT CARCTEW, CORNWALL



FIG. 28. QUERCUS CRASSIPES

ARCTOTIS MIRABILIS,* DÜMMER (*sp. nov.*).

By R. A. DÜMMER, F.R.H.S.

It has been averred by some that South Africa is devoid of indigenous annuals, but whoever has chanced to display an interest in the flora of that region knows this to be fallacious and accredits such statements to armchair philosophers. Indeed, even on the Cape Peninsula, where the shrubby vegetation is pre-eminent, *Dimorphotheca annua* in its myriads clothes the slopes of Signal Hill, and in spring invests them with a snowy covering noticeable from a distance of several miles. *Cenia* species, small and of little floricultural interest, many *Nemesias*, *Senecios*, *Helioplasas*, *Wahlenbergias*, *Chironias*, and *Belmontias*, some of singular beauty and charm, the ubiquitous *Drosera cistiflora*, far outvying any of the British species in elegance and in the size of its flowers—all in their respective seasons add much to the beauty and interest of the vegetation.

So also *Grammanthes gentianoides* in its thousands adds gold to the Muizenberg, whose slopes meet the lapping waters of False Bay, while *Mesembryanthemum criniflorum*, as lowly as the preceding, but with flowers larger than a half-crown piece, of a pure white which gradually merges to a lovely pink, does much to beautify the otherwise arid localities.

It is, however, in the western region of Cape Colony, especially in Little Namaqualand, where this type of vegetation is most pronounced, where with the first spring rains the annuals spring up "as if in the night," and clothe veldt, kopje, and valley with a gorgeous and varicoloured mantle, which unhappily too soon is followed by a desolation most profound—when every sign of vegetation virtually disappears—the effects of the succeeding intense drought. As MARLOTH well described it in his fascinating "Das Kapland": "Much exposed rock and sand obtains, besides innumerable shrubs, herbs; and grasses, as also bulbous plants. True, the greater part of the time little of the latter are visible, but in spring, especially in August and September, they carpet the whole land in gorgeous hues. Particularly prevalent are Composites, Scrophulariaceous members, Crucifers, and Mesembryanths. Many *Arctotis*, *Gazania*, and *Gorteria* species possess flower-heads double the size of an ordinary *Calendula*, and; moreover; often flaunt their beauty in three distinct colours. Mile upon mile—a blaze of colour, preponderatingly yellow, red or orange, but also white or blue harmoniously blending—here and there replaced by stretches of the gently waving grass *Stipa tortilis*, or yellow-flowering stands of *Euphorbia mauritanica*." Now this region, though traversed by the intrepid pioneers and naturalists DREGE and BURCHELL and

* *Species nova, distinctissima, capitulis majusculis.*

others intent on botanical spoils, offers a veritable Eldorado to those seeking to render horticulture a service by the introduction of novelties, especially where annuals are concerned. Of these none merit introduction more than the 'Namaqualand Daisy,' an annual which is reputed to occur in considerable abundance in the vicinity of Klipfontein, Little Namaqualand, whose flower-heads exceed 4 inches in diameter. Despite its reputed abundance, however, it appears to be a rather local plant, for none of the botanical collectors seem to have stumbled across it, and it is only through Miss EDITH FOXWELL, who presented Kew with a dried specimen in May 1902; that I am able to proffer a tentative description of this plant, an *Arctotis*, and one unknown to science, and named *A. mirabilis* in view of its extraordinary size, and therefore the horticultural possibilities of the species. Unfortunately the specimen is devoid of leaves, but on account of its floricultural value, and as an aid to its identification, the following description is given :

Peduncle stout, terete, longitudinally grooved and sparingly puberulous between the grooves, bearing a solitary flower-head, which when expanded is $4\frac{1}{2}$ inches in diameter, the ray florets numbering about 65, oblong-lanceolate, obtuse and entire at their tips, narrowing gradually from the middle to the base, 3-4-nerved, the outer $1\frac{1}{2}$ inch long, and averaging $\frac{1}{2}$ inch in breadth, probably white in the living state, the inner slightly shorter and marked at their bases by dark violet inversely triangular apically 3-4-toothed blotches about $\frac{5}{16}$ inch long. 'Eye' circular, slightly convex, $1\frac{1}{2}$ inch across, dark brown or blackish. Innermost involucral scales oblong-spathulate, membranous and whitish towards their tips, scarious and opaque basally, $\frac{1}{2}$ - $\frac{3}{4}$ inch long, $\frac{1}{6}$ - $\frac{1}{8}$ inch broad.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXII.—THE ROGUE WALLFLOWER.

By F. J. CHITTENDEN, F.L.S.

FROM time to time there appears among wallflowers a rogue form apparently without petals and looking at a cursory glance as though the flowers had failed to open. This rogue form is not confined to any one variety, but occurs in both yellows and reds.

The form has been known for a long time and has even received a botanical name, for A. P. DE CANDOLLE * describes it under the name *Cheiranthus Cheiri* γ *gynantherus*, with the following diagnosis: "Antheris nempè in carpellâ mutatis." It appears to arise suddenly from time to time, but, as the observations to be described below show, it may possibly be that certain apparently normal individuals among wallflowers are so constituted that their seed necessarily produces both normal and rogue form. That is, they may be hybrids in the Mendelian sense and, so to speak, carry the characters of both normal and rogue forms. On the other hand, we have no evidence to show that the rogues do not arise suddenly as seminal sports.

The malformation existing in the rogues is a very peculiar one, in which both petals and stamens are involved. The petals are reduced to oblong coloured pieces about the length of the sepals or a little shorter. A remark in MASTERS' "Vegetable Teratology" † seems to infer that at times the petals may be developed normally. He says, "In most of the flowers of this variety the petals are smaller and less perfectly developed than usual." BRONGNIART ‡ makes a similar remark: "Dans ces *Cheiranthus* monstrueux, qui étaient très nombreux dans les parterres du Muséum en 1841, les sépales et les pétales existent dans leur position habituelle, mais en général les pétales ne prennent qu'un développement imparfait, ce qui signale immédiatement les plantes qui sont le siège de cette monstruosité." We have not, however, met with any cases in which normal petals were developed. It is almost to be expected that such cases would occur, for it is scarcely credible that a single character-determinant should produce the remarkable and dissimilar abnormalities which occur in both petals and stamens.

* DC. *Prodromus*, I. p. 135 (1824).

† MASTERS, M. T., *Vegetable Teratology*, p. 305 (1869).

‡ BRONGNIART, A., "Sur quelques cas de transformation des étamines en carpelles." *Bull. de la Soc. Botanique de France*, t. 8, p. 453 (1861).

The most extraordinary change, however, is in the stamens which are converted into carpels. As ALLMAN* has pointed out, there is considerable variation in the number of the supplementary carpels and in their adhesion. The full number is six, derived from the six stamens, but those corresponding with the two lateral stamens are not infrequently smaller than the others or altogether absent. ALLMAN found the ovary with the short style of these supplementary carpels was derived from the filament of the stamen, while "the stigma was plainly a transformed anther."

BRONGNIART† has well described the various forms of this rogue met with, all of which we have seen in our own cultivations (fig. 29). We cannot do better than quote Dr. MASTERS' translation of his notes.‡ "Sometimes these six carpellary leaves are perfectly free, and in this case they spread open, presenting two rows of ovules along their inner edges, or these edges may be soldered together, forming a kind of follicle like that of the Columbine; at other times, these staminal pistils are fused into two lateral bundles of three in each bundle, or into a single cylinder which encircles the true pistil. In a third set of cases these outer carpels are only four in number, two lateral and two antero-posterior, all fused in such a manner as to form around the normal pistil a prism-shaped sheath, with four sides presenting four parietal placenta, corresponding to the lines of junction of the staminal carpels."

The conversion of stamens into carpels is a comparatively rare phenomenon, though conversion of stamens into petals is frequent. It occurs in *Papaver somniferum*, and we have seen it in *P. orientale* in our own garden, but in these cases only some of the stamens are transformed; it has also occurred in *Polemonium coeruleum*. MASTERS§ quotes GOEPPERT as saying that the peculiarity in *P. somniferum* was reproduced by seed for two years in succession, but whether the seed was produced by the central or the supplementary carpels he does not say, while BRONGNIART|| obtained fertile seed of *P. coeruleum* from both central and supplementary carpels. He does not record the result of sowing this seed, however.

No one seems to have tried to obtain seed from the lateral carpels of the rogue wallflower until Professor G. HENSLOW, in 1910 or 1911, pollinated flowers of a rogue which occurred in his garden at Leamington.¶ Some of the flowers he pollinated from a red, others from a yellow variety. Both central and supplementary carpels set seed, the former much more than the latter. This seed was sown at Wisley and grown on to flower, the plants produced being all alike except

* ALLMAN, Prof. G. J., "On the Morphology of the Fruit in the Cruciferae, as illustrated by a monstrosity in the Wallflower." *Report Brit. Association*, July 1851 (*Ipswich Trans.*, p. 70 (1852).

† BRONGNIART, A., *l.c. ante*.

‡ MASTERS, M. T., *l.c. ante*.

§ *l.c. ante*.

|| *l.c. ante*.

¶ JOURNAL R.H.S. xxxviii, p. xxxix (1912).

in colour, and all normal. None showed variation in number or form of petals, stamens, or carpels, but both red and yellow flowers were produced, some of the former with streaks of yellow. The normal type was thus clearly completely dominant to the rogue. We do not know to which colour type the original rogue belonged.



FIG 29 THE 'ROGUE' WALLFLOWER WITH DETAILS OF VARIATION IN THE FLOWER STRUCTURE.

Seed was saved from these plants interpollinated and sown as soon as ripe. Some of the resulting plants flowered in 1913 and showed that the seed had given rise to two types, the normal and the rogue, but as many had not arrived at flowering size they were all grown on to flower in 1914. A few plants died from one cause or another, but 143 flowered, and of these 101 were of the normal

type (both red and yellow) and 42 of the rogue type (both red and yellow). On the assumption that we have to deal with a simple 3 to 1 Mendelian segregation, the expectation would be 107 normals and 36 rogues, and the numbers obtained are sufficiently near to the expectation to suggest that simple segregation is taking place.

The case is a particularly interesting one, for the differences between the two forms are marked and complex, and the fact that the dominance is complete is in itself very interesting. As we have said, the change from maleness to femaleness is a rare one, but the results of the experiment seem to show that in *Cheiranthus* femaleness is recessive to maleness.

The persistence of this rogue type in small numbers, even though now great care be exercised in eliminating them from plants growing for seed, may be readily understood, if we assume the rogue on its first occurrence produced seed.* The seeds produced by it must have been hybrids, since the rogue itself produces no pollen, but they would doubtless have been sown among others from perfectly normal plants, and the culture would consist of many true normals, and a few hybrids, apparently normal, and quite indistinguishable from the normals in structure. The normals would far outnumber the hybrids, and the chances of interpollination among the latter would be correspondingly small, with the result that, while hybrids would be produced with each succeeding generation, rogues—the pure recessives—would rarely appear.

We may show this graphically by the following diagrams, where N stands for the dominant normal, r for the recessive rogue.

Crossing the rogue with the normal (which can be done only one way) we have :

$$\begin{array}{ccc} \text{N } \delta & \times & \text{r } \text{?} \\ | & & \\ \text{Nr } \downarrow & & \\ \text{(hybrid)} & & \text{F}_1 \end{array}$$

Seed may be produced by the Nr plants either by intercrossing among themselves or by crossing from the normals, and the results will be different in these two cases :

1. Where the hybrids intercross:

$$\begin{array}{ccccccc} & & \text{Nr} \times \text{Nr} & & & & \\ & & | & & & & \\ \text{NN } \delta & & \text{Nr } \text{?} & & \text{Nr } \text{?} & & \text{rr } \text{?} \\ & & \underbrace{\hspace{1.5cm}} & & & & \\ \text{(normal)} & & \text{(hybrid)} & & & & \text{(rogue)} \end{array}$$

and rogues will reappear in the proportion of one to three, two of which are hybrids.

* Rogues allowed to grow among plants produce a few seeds without artificial pollination.

2. Where the hybrids cross with the normal (the most likely thing to happen):

$$\begin{array}{ccc}
 & \text{NN } \delta & \times \text{Nr } \delta \\
 & | & \\
 \text{NN } \delta & \text{-----} & \text{Nr } \delta \\
 \text{(normal)} & & \text{(hybrid)}
 \end{array}$$

normals and hybrids being produced in equal proportions. Besides these there are numerous normals breeding true, so that the *proportion* of hybrids to normals will diminish in succeeding generations. They could be eliminated by breeding from individuals, but as this is not done the hybrid type persists and there is always the possibility (although a remote one) of a rogue being thrown off, even without the possible occasional variation that is usually supposed to account for the production of these monstrous forms, and quite apart from the physical environment of the plants grown for seed.

EXAMINATION IN HORTICULTURE.—GENERAL.

APRIL 1, 1914.

ONE HUNDRED AND EIGHTY-SIX candidates entered for the Society's Senior General Examination on April 1, 1914. Six of these, however, did not present themselves.

The Examiners, the Rev. Prof. G. Henslow, M.A., V.M.H., and Mr. J. Hudson, V.M.H., report that of the Senior candidates obtaining a place in the Pass List, 9 or about 5 per cent. were placed in the first class; in the second class, 36 candidates, or 20 per cent.; and in the third class, 122 candidates, or 68 per cent.

Thirteen candidates failed to show a sufficiently high standard of knowledge to appear in the List.

One hundred and eighteen candidates entered for the Junior Section of the General Examination. Of these one was absent; 1 obtained a first class; 6, or 5 per cent., a second class; 51, or 43 per cent., a third class; and 31, or 26 per cent., a fourth class; leaving 28 candidates unsuccessful.

Several candidates misunderstood the meaning of "respiration," and gave descriptions of either transpiration or assimilation. It is very necessary for an understanding of plant activity to discriminate clearly between these functions.

The Examiners were particularly pleased with the answers of some candidates on certain questions. These will be written to individually.

It is a pity that candidates are not more careful to follow the rules laid down for the conduct of the Examination. For example, several answered more questions in either Section A or B than were asked for, and, of course, the surplus answers had to be ignored.

The addition to an answer of such communications as "Time up" etc. is far from desirable, and at once leads the Examiner to expect poor answers. Indeed, it is almost invariably the rule that such words are inserted by those who have written the least amount, and they tend to call attention to a candidate's weakness in his subject.

W. WILKS, *Secretary*.

SENIORS: over 18 years of age.*Class I.*

1. { Hill, L. R., Thatcham Fruit and Flower Farm, Newbury.
King, G. D., Thatcham Fruit and Flower Farm, Newbury.
3. Mallinson, S., Horticultural College, Studley.
4. { Chancellor, W. T., School House, Bruton, Som.
Gosden, E. E., 30 Vardens Road, New Wandsworth, S.W.
- { Rowlands, J., 13 Ravenscliffe Road, Kids Grove, Stoke-on-Trent.
- { Friend, F. M., Horticultural College, Swanley.
7. { Page-Wood, M. A., East Anglian Sanatorium, Nayland.
Wright, G. O., Horticultural College, Studley.

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Wilson, G. F., R.H.S. Gardens, Wisley, Ripley, Surrey.
- { Fawcett, E. B., Horticultural College, Studley.
5. { Moxhay, A. M. W., Thatcham Fruit Farm, Newbury.
Scott, J. C., Thatcham Fruit and Flower Farm, Newbury.
- { Campbell, M. H., Elmwood School of Gardening, Cosham.
8. { Drage, N. M., Horticultural College, Swanley.
Sumner, M., University College, Reading.
- { Gunston, H. D., School House, Long Ashton, Bristol.
- { Rawson, O. E., Greenway Court, Hollingbourne.
11. { Tufnell, E. T., Thatcham Fruit and Flower Farm, Newbury.
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- { Portway, M., E. Anglian Institute of Agriculture, Chelmsford.
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- { Owen, G. M., R.H.S. Gardens, Wisley, Ripley, Surrey.
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32. { Gadsden, L. H., Thatcham Fruit and Flower Farm, Newbury.
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79. Johnson, S. J., St. Benet's Home, Caversham, Reading.
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JUNIORS.

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1. Gethen, H., E. Anglian Inst. of Agriculture, Chelmsford.
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6. { Adams, E. W., Stoke Farm School, Bromsgrove.
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8. { Cook, H., Boys' Industrial School, Ayr.
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12. { Rae, J., E. Anglian School of Agriculture, Chelmsford.
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14. { Knights, C. F., Industrial School, Buxton, Norfolk.
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Clegg, C., Lostock Industrial School, Bolton.
23. { Debenham, L. V., Rectory Cottage, Ash, Kent.
Errington, R. S., Netherton Training School, Morpeth.
Gregory, E. F., Kingswood Reformatory School, Bristol.
Jardine, J., Reformatory School, Stranraer.
23. { Seaton, C. V., Stoke Farm School, Bromsgrove.
Smith, A., Lostock Industrial School, Bolton.
33. { Smith, A. R., Stoke Farm School, Bromsgrove.
Dennis, A., 2 Manbridge Cottages, Swaythling, Hants.
Gibbons, R. C., Industrial School, Buxton.
33. { Giles, J., Stoke Farm School, Bromsgrove.
Hall, B., Stoke Farm School, Bromsgrove.
39. { Riggs, F. E., Ingleton, Hampton Park, Southampton.
Wilkinson, E., Lostock Industrial School, Bolton.
39. { Huartson, J., Lostock Industrial School, Bolton.
McKenzie, J., Boys' Industrial School, Ayr.
43. { Smith, W. G., Stoke Farm School, Bromsgrove.
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43. { Farnworth, H. F., Lostock Industrial School, Bolton.
Hunter, W., Boys' Industrial School, Ayr.
43. { Lee, F., Liverpool Farm School, Newton-le-Willows.
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EXAMINATION OF SCHOOL TEACHERS IN COTTAGE AND ALLOTMENT GARDENING.

APRIL 22, 1914.

EIGHT hundred and twenty-eight Candidates entered for the Examination of School Teachers in Cottage and Allotment Gardening, held on April 22, 1914, 32 obtained a first class, 399 a second, and 295 a third, leaving 87 failures, and 15 absentees.

The Examiners, Mr. F. J. Chittenden, F.L.S., Mr. John Fraser, F.L.S., Mr. W. Crump, V.M.H., and Mr. C. R. Fielder, V.M.H., report that the general standard of the answers was good. Systematic order in the answers is, however, very frequently wanting—a matter for surprise in an examination of Teachers. Verbosity, instead of conciseness, is another failing.

A better knowledge than in previous examinations was shown on artificial manures, and some very good answers indeed were given on Pests, Crop Rotation, and Hardy Perennials. The difference between hardy and half hardy, perennial and annual plants, was again a prominent difficulty. Candidates would identify them more readily by studying the R.H.S. Code of Rules for Judging, a new edition of which has just been published, price 1s. 6d., post free from the R.H.S. Office, Vincent Square, London, S.W. The restoration of neglected land was well understood, though some forgot the shallow pocket of allotment holders and cottage gardeners. The principles underlying the planting of fruit trees were not understood, the directing of roots to run DOWNWARD into soil mixed with strong farmyard manures being quite a mistake. Selections for successional plantings were out of date, and the prices of fruit trees were not those usually prevailing.

The questions in Section B were rarely answered completely. Transpiration was confused with respiration, and, in the majority of cases, processes of absorption with transpiration. Much irrelevant matter was thus introduced.

Another point upon which considerable misapprehension still exists is the relative value of vegetative propagation compared with seed-raising, many answers being vague or entirely beside the point.

Candidates would have a clearer conception of plant life if they paid greater attention to such details. The most serious failing—not, perhaps, so much as regards mere facts as in the attitude of mind betrayed—appeared in the answers concerning garden pests. Few candidates showed how an accurate knowledge of the structure, habits, and life-history of a pest can be made the basis for the discovery of a practical method for dealing with it. It is of little use being told to spray for the caterpillar of the winter moth if when, and with what, are not stated; and to have assurance to give reliable directions on such matters, a definite and complete knowledge of the pest is the only sure ground to work upon. Many stated that a caustic wash would kill eggs of winter moth, and the like, but this is erroneous, and ought, with the old error that the cabbage white butterfly pupates in the soil, to be relegated to the limbo of mistaken notions which scientific investigation has exposed.

W. WILKS, *Secretary*.

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 Boulter, S. G., South Ockendon, Romford.
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 Crowfoot, R., Equity Villa, Earl Shilton.
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 Durdle, A. A., The Den, Hilliard Road, Northwood.
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 Robinson, W. H., Parkgate, Woodstock Road, Witney.
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 Walters, C., Pengeulan C. School, Mountain Ash.
 Braithwaite, T. J., School House, Baldersby S.O., Yorks.
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 Hadler, M. F., Marden Ash, Ongar.
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 Mathews, A. G., 89 Moorgate, Retford.
 353. Mitchell, W. D., 42 Outwood Street, Burton-on-Trent.
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 Osborne, H. C., 20 Malmains Road, Dover.
 Palmer, H., 178 Lancaster Road, Notting Hill.
 Scott, G., 1 Westbourne Gardens, Trowbridge.
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 Young, E., Bellecroft, St. John's, Redhill.
 373. Appleby, R., 14 North Terrace, Brusselton.
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- Cooper, E., Cheltenham Road, Winchcombe.
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 Gomm, E. N., Sunnyside, Ketley Town, Wellington.
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 Leech, H., School House, Cheswardine.
 Lyon, J. D., Keir School House, Thornhill.
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 Hallworth, T., Ivy Cottage, High Lane, Stockport.
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255. { Hinchliffe, A., The Bungalow, Station Road, Nailsea.
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NATIONAL DIPLOMA IN HORTICULTURE.

PRELIMINARY EXAMINATION.

JUNE 13 AND 23-26, 1914.

THE first Examination of Professional Gardeners for the National Diploma in Horticulture (Part I.), recently established by the Council of the Royal Horticultural Society, with the approval and co-operation of the Board of Agriculture, was held on June 13 and 23-26.

Sixty-three candidates entered for the examination, of whom 43 passed, viz. 6 in the A Division and 37 in the B Division, leaving 17 who failed to satisfy the Examiners, and 3 who did not present themselves. The examination was partly written, partly practical, and partly *viva voce*.

The decision to make a test of craftsmanship an essential part of the examination is justified by the fact that whereas no candidate who passed the practical test failed in the written examination, several of those who did well in the latter failed in the former.

The practical examination was carried out at five centres—Wisley (R.H.S. Gardens), Edinburgh (Dalkeith Garden), Cardiff (Duffryn Garden), Manchester (Worsley Garden), and Peterborough (Orton Longueville Garden), where each candidate was required to perform a full day's practical work in the presence of the Examiners.

The Society is under a great debt of gratitude to the Duke of Buccleuch, K.G., K.T.; the Marquis of Huntly, P.C.; the Earl of Ellesmere; and Reginald Cory, Esq., for kindly lending their gardens for the examination.

Of the candidates, those who presented themselves at Edinburgh showed generally the best craftsmanship.

The proportion of young to mature gardeners who entered for the examination was comparatively small. There is good reason to believe, however, that their relative number will increase greatly in the immediate future.

FREDERICK KEEBLE, F.R.S.,
Director of the R.H.S. Gardens,
Wisley.

W. WILKS, M.A., V.M.H.,
Secretary.

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BOOK REVIEWS.

"Gardens of the Great Mughals." By C. M. Villiers Stuart. 8vo., xviii + 290 pp., with 40 full-page illustrations. (A. & C. Black, London, 1913.) 12s. 6d. net.

Readers of gardening literature will heartily welcome this book, which breaks entirely fresh ground, dealing as it does with the romantic gardens constructed by the great Mughal rulers of India, which now for the most part are left uncared for or exist only in ruins. These Mughal gardens were made during the sixteenth and seventeenth centuries, and were copied from the earlier gardens of Turkestan and Persia. They were invariably rectangular in plan, divided up into smaller squares or parterres, the whole enclosed within a high wall, with usually four lofty and imposing entrance gateways. Throughout the whole length of the garden ran a water-canal (irrigation being essential) edged with stone or brick, and in the larger gardens additional side-canals were formed. The canals usually flowed into large fountain-studded tanks, and in the largest of the sheets of water thus formed was usually placed the principal pavilion, which was thereby rendered a cool retreat from the heat of the burning noontide sun. Round the outer garden-walls avenues of trees were planted, while the square plots intersected by the watercourses were filled with fruit trees or elaborate parterres of flowers. The design of these gardens was closely interwoven with the history of the country, and the life, traditions, and religious ideals of the people by whom they were planned, and each tree and flower had originally its symbolic meaning and method of arrangement. The volume describes a number of such gardens, or the remains of such as exist at the present day, and the descriptions are enhanced by photographic reproductions of delightful Mughal miniature paintings illustrative of Indian gardens. Incidentally the author recalls the fact that the Mughal gardens of the sixteenth century resembled in many ways the gardens of Tudor England, which "now, alas! have nearly all vanished, their last vestiges swept away by the sham romanticism of the eighteenth century and the zeal of those who followed the traditions of the once-lauded gardener 'Capability' Brown." It was the introduction into India of the English landscape garden of the eighteenth century, coupled with the change in the habits and manners of the Indian people, particularly as regards the methods of travel, that the author considers has led to the neglect of Indian garden-craft at the present day and the divorce of horticulture and garden design. It was the old Mughal garden that supplied the leading motive in Mughal decorative art and still underlies the whole artistic world of the Indian craftsman and

builder. Such being the case, readers of this fascinating volume will share with its author the hope expressed in the concluding chapter that in planning the new Delhi the Indian garden may be made to play an important part. "If the palace at the new Delhi could form part of a scheme with a great Imperial Indian Garden, with its symbolic divisions, waterways, avenues, fountains and walls, Indian art would receive a stimulus and Indian loyalty a lead which it would be impossible to overrate, although hard to believe in England, where the gardens, beautiful as they are, lack the practical use and deeper religious significance of Indian garden-craft."

"The Plant Societies of Chicago and Vicinity." By H. C. Cowles. 8vo., 76 pp. (University Press, Chicago, 1913.) 2s. net.

Plant ecology is being studied enthusiastically, and many books are appearing treating it in various ways. The word itself means "Home-study," and this may be pursued with various aspects. First, the physical environment or "home" of the plant may be the object; secondly, the plant's structure, internal and external, may be studied to discover their physiological correlations with the various external factors of the conditions of life; thirdly, what plants are associated together in any special kind of environment, as heathland, marsh, woodland, alpine, maritime places, &c.; lastly, the ecologist looks to discover what evidence exists to show how the plants of any association have *acquired* their special morphological characteristics, so as to be in adaptation to them, *i.e.* their evolutionary history.

The author regards the physiological aspect as one phase of ecology; but the second—the subject of the present treatise—is to treat plant societies from a physiographical point of view. The author discusses the three types of soil in the vicinity of Chicago, viz. moraine, or boulder-clay deposit; the Chicago plain; and beach or dune sands. Three types of vegetation correspond with the above: the mesophytic upland forests of the morainic clays; the hydrophytic lakes and swamps, with the mesophytic prairies; and the xerophytic forests of the dunes and beaches.

The keynote of the paper, the author says, is that each particular topographic form has its own peculiar vegetation.

The most important and *new* feature in the paper is the recognition and description of the *process of topographical changes*, with the subsequent changes in the vegetation.

These are effected by erosion, which causes the wearing down of hills and the filling up of valleys, *i.e.* denudation and deposition. The consequence is that certain plant societies disappear and are replaced by others, better adapted to the new conditions.

"One thing more must be recognized, and that is that environmental influences are normally cumulative. A plant society is not a product of present conditions alone, but the past is involved as well. For example, a hydrophytic plant society may be seen growing in a mesophytic soil."

Conversely, we may add, upland xerophytes are sometimes found in bogs. These facts are probably to be explained in the self-adaptability of plants to new conditions of life; so that they alter their *internal anatomical* tissues in adaptations without much *external morphological* alteration. Such is the case with *Ranunculus aquatilis* when growing in the air.

As the hills are xerophytic, the hollows hydrophytic, and the plains mesophytic, erosion tends to reduce the first and fill up the second; so the process tends to produce a general mesophytic state. The author deals with three aspects of the INLAND GROUP: the River series; the Pond-swamp-prairie series; the Upland series. The COASTAL GROUP contains the Lake-bluff series and the Beach-dune-sandhill series. We may take the first as an example of the author's method of procedure. He commences with *The Ravine*. Admirable photographs show how, beginning with a ravine, or narrow, more or less deep, channel, cut in a clay moraine, a broad valley is gradually formed, where lateral erosion is more pronounced. From this stage the destructive and constructive processes are considered in the final development of a "flood plain." In the first or ravine stage there is no vegetation, in consequence of the instability of the soil and landslides. Torrents deepen the ravine, which becomes wider with gently sloping sides, when vegetation begins. In a few years, from herbs, it becomes a mesophytic forest, as of maples.

Having reached a temporary climax of a rich mesophytic association of forest trees and undergrowth, the erosive processes of the river, widening processes, prevail over the more primitive deepening. As a result the exposure to wind, sunlight &c. increases, moisture becomes less, and a new xerophytic flora shows signs of invasion at the top of the ravine slope. This gradually creeps down the slopes and vegetation becomes much less luxuriant.

River-bluffs and flood-plains are similarly described from their origin to completion, and how they become inhabited by vegetations of hydrophytes &c. according to the nature of the soil. The above will indicate the author's treatment; it is interesting as being rather a new departure in the treatment of ecology.

"Date-growing in the Old and New Worlds." By Paul B. Popenoe. 8vo., xviii + 316 pp., with 40 full-page illustrations. (West India Gardens, Altadena, California, 1913.) \$2.00 net.

This book, on a subject about which little has been written in English, is the result of two years' travel and inquiry in the date-growing regions of the East on behalf of the West India Gardens, Altadena. The countries from which the dates of commerce are chiefly derived are Arabia, Mesopotamia, and North Africa, but there are parts of the United States, especially in California and Arizona, where the date-palm has been proved successful, and where in the near future a large and profitable industry in date-growing will probably be established.

The total annual consumption of dates in the United States is

estimated at about 32,000,000 lb., or 5 ounces a head of the population. A large home market, therefore, already exists, and in view of the food value of the date this could probably be greatly increased with advantage to the consumers were it possible to produce clean dates of good quality and appearance in the country.

The book gives full details regarding the soil and climatic requirements of the date-palm, and the importance of propagating suitable varieties by means of offshoots rather than by seeds is emphasized. Particulars are also given as to the artificial pollination of the flowers, the methods of handling and ripening the crop, the pests and diseases to which the trees are liable, and of the cost of forming a plantation and the probable profits to be derived therefrom. A descriptive list of varieties is also given. Intending planters in the States, for whom the book is written, will find in it much useful information, and general readers will also find it interesting, particularly those chapters on the food value of the date contributed by Charles L. Bennett, M.D., and the Arab uses of the date. The book contains some excellent photographs and is furnished with a full index.

“Rubber and Rubber Planting.” By R. H. Lock, Sc.D. 8vo., xi + 245 pp., with 10 full-page illustrations and 22 figures in the text. (University Press, Cambridge, 1913.) 5s. net.

Owing to the heavy fall in the price of rubber during the last two years, the interest taken in this product by the general public has somewhat waned; nevertheless there is a sustained increase in the number of books treating of this subject in some one or other of its many aspects. In this handbook Dr. Lock attempts to cover a rather wide field, in that he treats of both wild and cultivated rubber and also of the chemistry of rubber and the manufacture of rubber goods.

By far the greater part of the book is devoted to plantation Pará rubber (*Hevea brasiliensis*), which is now being produced in large and increasing quantities in the East, especially in Ceylon and the Federated Malay States. Dr. Lock was formerly Assistant Director of the Botanic Gardens in Ceylon, and in that capacity conducted many experiments in connexion with the rubber industry, particularly with regard to tapping the *Hevea* tree. The results of these experiments are set forth in the handbook, together with an interesting account of the physiology of latex production and the chemical composition of latex. Other chapters treat of the practical work in connexion with planting operations, the collection of the latex, and the preparation therefrom of rubber for export. The manufacture and chemistry of rubber are briefly dealt with in the concluding chapters.

Although there is little that is new in the handbook, the information is accurate and is presented in a convenient and readable form.

The illustrations comprise reproductions of photographs and figures in the text; the latter, representing different rubber-producing species, were drawn by Mr. L. Denton Sayers, and form a valuable feature of the book.

"Educational Handwork: A Complete and Varied Course for Schools." Bk. III. Special Subjects for Upper Standards in Rural Schools. By Wm. Taylor and Wm. J. Raynor. 8vo., viii + 249 pp. (A. Brown, London, 1913.) 4s. 6d. net.

A well-arranged, well-written book covering much ground. The experiments in Nature Study are well chosen and should prove conclusive to children who perform them. The book is written for teachers employed in rural schools.

"Educational School Gardening and Handwork." By G. W. S. Brewer. 8vo., 192 pp. (Cambridge University Press, 1913.) 2s. 6d. net.

The greatest pleasure a teacher will feel on reading this excellent book is that the author has treated his subject from a teacher's standpoint and fully realizes the difficulties to be overcome when dealing with children of school age.

It is refreshing to meet a text-book on this subject which keeps well in view the fact that gardening can only claim a place in the school curriculum on educational grounds. The vocational side is happily almost ignored.

Having made such a splendid beginning, it is not a matter for surprise that the author is also correct in his methods of teaching. Throughout the book his motto is "Let the child learn by doing." We know from experience that this method, though somewhat slower than "telling," produces superior ultimate results.

A teacher who reads this book cannot fail to find that he goes to his work strengthened and encouraged.

This manual ought to appeal to all teachers, as it is built upon sound principles which can be applied to all forms of school work. The suggestions for woodwork and metal-work are valuable.

The book is well arranged and well printed, and the diagrams are above the average. The book is a credit to its author and publisher alike.

"Planting in Uganda." By E. Brown, F.L.S., and H. H. Hunter, LL.D. With contributions by Professor Dunstan, C.M.G., and George Masee, F.L.S. 8vo., xvi + 176 pp. With 41 illustrations and 2 maps. (Longmans, London, 1913.) 10s. 6d. net.

The region comprising the Uganda Protectorate is situated along the northern and north-west shores of Lake Victoria Nyanza, in Central Africa. Recently this country has attracted the attention of planters and investors, and as a consequence it has made rapid progress in agricultural development. This satisfactory development, as Professor Dunstan points out in the introduction which he contributes to this book, is in a large measure due to the work of the Scientific and Forestry Department, which was established by the Government some years ago mainly for experimental work of a pioneer nature.

Although the title of the book would lead one to expect a general treatise on planting, the only subjects dealt with are coffee, cocoa, and rubber. These three subjects are the most important in Uganda at the present time, and those with which the writers have been chiefly concerned; but there are others, notably cotton, which have been successfully cultivated and which will probably be largely developed in the future.

The book gives full details as to the planting, cultivation, harvesting, and preparation for export of the three crops with which it is especially concerned, and particulars as to cost and estate management, and as hitherto no such information has been available in a convenient form, this work will be of great value to intending planters. The Uganda planting industry, being young, the data relating to it do not extend over many years, but so far as information is available the country would appear to be well suited to the three crops dealt with. The arrangement of the matter is not altogether satisfactory, and we should have preferred the three crops treated separately, as the reading at present is somewhat disconnected. The illustrations are well reproduced and are very instructive.

"The Horticultural Record." Compiled by Reginald Cory. 4to., 500 pp. (Churchill, London, 1914.) 42s. net.

Those who visited the International Horticultural Exhibition at Chelsea in 1912 will warmly welcome the appearance of this bulky volume, which, by special permission, has been dedicated to H.M. King George V. It is a work of such magnitude that we approach with some diffidence the task of endeavouring to compress into a narrow space anything like an adequate review of its contents.

"The Horticultural Record" is intended to be a permanent literary monument of the successful efforts made by the directors of that Exhibition to show the world what progress had been made in the United Kingdom and elsewhere in all branches of horticulture since 1866. The Exhibition itself was a gigantic effort, and Mr. Cory has, even with the editorial assistance of Mr. R. Hooper Pearson, made another in the compiling of the book which constitutes a record to which future organizers of international horticultural shows in this country must have recourse if they wish to meet with the degree of success that characterized the Show of 1912.

"The Horticultural Record" is divided into three parts: 1. Horticultural progress since the first Exhibition in 1866; 2. The Royal International Exhibition of 1912; 3. Illustrations of views in the Exhibition and of plants exhibited, a large number of which are given in colour.

In Part 1, writers, specialists in their own departments, trace the progress of the gardening art in its various branches through the past half-century, and an enumeration of authors and subjects will show how complete the record is.

Thus Mr. Reginald Farrer starts with a lengthy article in his

well-known style upon Rock Gardens and Garden Design. Mr. H. R. Darlington follows with an account showing the Development of the Rose. Then come contributions from Mr. W. J. Bean on Trees and Shrubs; from Mr. W. Cuthbertson on Sweet Peas; from Mr. W. Watson on Tropical Garden Plants. None better than Mr. James O'Brien could discourse upon Orchids, and his article is followed by one upon Greenhouse Plants. Mr. C. H. Curtis tells us about Carnations and Pinks, and Ferns British and Foreign could not have found a better exponent than Mr. C. T. Druery. Fruit by Mr. E. A. Bunyard and Vegetables by Mr. G. F. Tinley bring this part of the work to a close.

We now enter upon that part of the book which deals more directly with the actual work of the great Show, its festivities and conferences. Starting at page 180 is a list of the patrons, officers, and directors, with a full-page plate of the portraits of the latter; the vice-presidents, subscribers, and guarantors appear in the order named, not omitting of course the Empire and Foreign lists of honour which contain the names of many of the most distinguished horticulturists in the world. One great feature of the Exhibition was the lavish hospitality bestowed upon the jury and foreign guests, and it is pleasing to read the accounts of the various functions that were so generously provided by the Duke of Portland as President, the R.H.S. (whose banquet will long be remembered), Sir Trevor Lawrence, Mr. Leopold de Rothschild (who was president of the jury), and the visit to Windsor.

Passing over some purely formal matter we come to the report on horticultural education and the conference in connexion therewith, the report on legislation concerning plant diseases, and the conference held on that subject. The science exhibition and committee are also dealt with.

A large portion of the remainder of the book is devoted to complete lists of the members of the jury, arranged in the sections to which they were appointed to act, of special and county cups and medals, and of the exhibitors with the awards made to them, both competitive and non-competitive. The financial statement of the whole undertaking brings this part of the Record to a close. Parts 1 and 2 have each an index.

Part 3 of this work consists entirely of illustrations. Of these there are 117 in colour and many excellent ones in black and white. Considering all the difficulties it would be unfair to be too critical, although it must be said that the colour process employed is in some cases lacking in brilliancy, some of the plates of plants and flowers being dull and wanting in contrast. They comprise many views of walks and exhibits in the Show, both in the open and in the tents, of groups and gardens, and individual plants and blooms. The book is well printed in a clear, readable type with an excellent margin to the pages. It is neatly and substantially bound in dark brown canvas boards, and will be referred to with pleasure by all those at home and abroad who had the opportunity of paying the Show a visit during those ever-to-be-remembered bright sunny days of May 1912.

"My Garden in Spring." By E. A. Bowles, M.A. 8vo., xx + 308 pp. (Jack, London, 1914.) 5s. net.

Some gardens are for display, restless, clamorous, insistent ; some for retirement, quiet but for the songs of birds or the voices of children, gardens of sweet scents ; some to make homes for plants, few or many, because they are loved and cherished.

There are many of the last in England about the homes of poor as well as rich, where to walk is a pleasure, and the greater if while you walk the gardener tells you tales of this plant and that. The author's garden at his father's house is such a one. For a quarter of a century planting and replanting, altering here, preserving there, in the ground about his ancestral home, Mr. Bowles has been making homes for the plants his catholic taste has led him to acquire. Sometimes these pleasant gardens house but few types of plants, their owners' favourites, roses, carnations, narcissi, tulips, sweet peas ; but here we are taken round a garden which might boast—only to boast would be alien to garden and gardener alike—a collection of flowers greater and more varied than is possessed by many a botanic garden.

It was a happy thought to write an account of such a garden in its aspects in spring, summer, and autumn (for this is but the first of three books about it, and all who read it will eagerly wait the coming of the other two) ; for it gives an idea of the possibilities and the limitations of a single garden ; it tells of the successes with plants through a thorough knowledge of and sympathy with their requirements ; of failures where those requirements could not be, or were not, met ; of happy accidents in grouping ; of the use of plants for various positions for ornament and the like. Into such a garden as this the clamour of the battle for or against formal gardening does not enter ; each position in the garden is treated on its merits so as to form homes for plants ; and not the least use this book will serve is to show that a garden housing an enormous variety of plants may also be made a beautiful one, full indeed of such pictures as the beholder of stereotyped garden or pleasure grounds does not dream of.

The author takes his reader round the garden, tells him how this plant and that originated, where one or another floral gem came from, and how and why he has succeeded or failed with the plants he shows you ; all the while telling anecdotes of plants or people who grew and probably gave them to him. You are made to see the plants as their lover sees them, and never once do his words degenerate into catalogues of plants, which, however instructive and even amusing they may be, are out of place in a book describing a garden and how it was made and grew. You cannot help but feel that if you really were with him in his garden he would load you with plants as he has given you of his knowledge, and you would come away richer and happier for having been there.

No doubt every gardener worthy the name—and our author is pre-eminently worthy the name—has some favourites among his plants, and even our author's catholic taste has not prevented him from having

some. Crocuses come in for a great share of his love, and we can only hope with him that some of his enthusiasm for them may infect his readers. If only for their courage in facing the dull months, they ought to have a place in every garden where they are only represented by the Dutch Crocuses now. From September to the middle of April we have had some bright patches in our garden made by Crocuses, and they are worth growing for other reasons than this.

For the author, spring begins with the flowering of *Iris unguicularis*, and it ends with the May flowering Tulips, and we can only hope that the opportunity of continuing our tour of his garden in summer may not be long delayed, for we anticipate great pleasure and not a little profit from it.

The book is adorned with twenty-four black-and-white plates depicting scenes or plants in the garden, both beautiful and instructive, and there are in addition sixteen coloured plates, most of which it would have been better without.

One little grumble we must indulge in—no other is called for—but we cannot think the author was consulted when the cover was chosen.

“La Fumure raisonnée des Légumes et des Cultures maraîchères.” By R. Dumont. 8vo. 195 pp. (Librairie Larousse, Paris, 1913.) Paper covers, 3 fr.

“La Fumure raisonnée des Fleurs et des Plantes ornementales.” By R. Dumont. 8vo. 152 pp. (Librairie Larousse, 1913.) Paper covers, 2 fr.

“La Fumure raisonnée des Arbres fruitiers et de la Vigne.” By R. Dumont. 8vo. 191 pp. (Librairie Larousse, 1913.) Paper covers, 3 fr.

These three books give outlines of the principles of manuring of the plants dealt with, accounts of experiments on manuring, and recipes for the compounding of manures for particular crops.

“Houses and Gardens.” By E. L. Lutyens. Described and Criticized by Lawrence Weaver. Folio. 344 pp. (Country Life, London, 1913.) £1 5s. net.

This is of course not primarily a garden book, although the garden in conjunction with house building forms an important part of its contents. It is essentially an architectural work, and a record of the life and labours of one who has devoted himself to the design and restoration of beautiful country homes, which necessarily includes a great attention to the immediate surroundings of such places. Hence the garden figures largely both in the descriptive text and in the numerous beautiful illustrations that adorn the work.

It may be mentioned that there are no fewer than six hundred full-page and other views of exteriors, interiors, and garden scenes depicted in the book. They are all of more or less interest to

lovers of artistic homes, and the great variety of them renders it almost impossible to specify them in anything like detail. There are also many plans of charming country homes given by way of fuller explanation.

Besides what may be termed the ordinary external architectural views of houses, there are many choice little bits showing dining-rooms, drawing-rooms, entrance halls, staircases, porches, garden gates, lily pools, paved gardens, entrances, courtyards, terraces, pergolas, and even wall gardens—in fact, every possible feature that can be dealt with by the architect called in by an owner to construct a comfortable and artistic dwelling with suitable surroundings.

In the introduction we have a general survey of the development and character of Mr. Lutyens' work, and from it we learn that he has been assisted in the purely horticultural part of his labours by Miss Jekyll, whose knowledge and experience in the gardening art have largely contributed to the successful results thus obtained. Indeed, there are some views of Miss Jekyll's home at Munstead Wood on which Mr. Lutyens began to work in 1896.

The development of his outlook had, as we are told, its starting-point in what may be roughly called the picturesque manner, and the period covered by the writer is from 1890 to 1913, during which time much valuable and interesting work has been accomplished. The letterpress is divided into twenty-six chapters, preceded by an introduction. Most of these chapters deal with several of the houses designed or restored by Mr. Lutyens; some of them, however, are devoted to one only. They include such subjects as the following: Crooksbury; Ruckmans; Garden at Woodside, Chenies; Sullingstead; Munstead Wood; Fulbrook; Orchards, Godalming; Goddards; Tigbourne Court; Littlecroft, Guildford; Overstrand Hall; The Pleasaunce, Overstrand; Deanery Garden, Sonning; Fisher's Hill, Woking; Homewood, Knebworth; Abbotswood, Gloucestershire; Marshcourt, Hants; Little Thakeham, Sussex; Papillon Hall, Leicestershire; The Hoo, Willingdon; Daneshill; Monkton, Singleton; Lindisfarne Castle, Holy Island; Gardens at Hestercombe; Ashby St. Ledgers; Heathcote, Ilkley; Lambay, Ireland; Great Maytham, Kent; Folly Farm; Hampstead Garden suburb, and elsewhere. So varied and comprehensive is the scope that there are also designs for town buildings, public monuments, exhibition buildings, &c.

It will be seen from the foregoing remarks that in the work under notice architecture claims the premier place, and that garden design occupies a subsidiary one, as it naturally should do in such a publication; but, at any rate, there is sufficient material in it to claim the attention of the gardener, be he amateur or professional. The photographic process by which the illustrations have been done is a beautifully exact one, and details are clearly and effectively delineated. That gardens and houses can be and are welded together into a harmonious whole is a fact amply demonstrated both by the text and by the accompanying illustrations throughout the book, and we have in our own

way, without pretending to any technical knowledge of house building, experienced much pleasure in our perusal of "Houses and Gardens."

Within the covers of Mr. Weaver's book are pictured many dainty little bits of beauty that we would gladly transfer to our own domain, if that were possible, and under the skilful care of Mr. Lutyens it is safe to affirm that many a desert place throughout the country has, not only in figurative language but in actual fact, been made to blossom as the rose. We are long past the era of Victorian ugliness in house construction, and men who are engaged in such work as his are creating for themselves a name that will long render them famous, and providing for future generations homes that are at once artistic to look at, comfortable to live in, and models for those who desire to imitate them.

The printing, illustrating, and binding do infinite credit to all concerned in its production, and the reader will be hard to please indeed who does not feel, as we do after perusing it, that it is with genuine regret that he is compelled to close its most attractive pages.

"Rock Gardening for Amateurs." By H. H. Thomas, assisted by S. Arnott. 8vo., 276 pp. (Cassell, London, 1914.) 6s. net.

The British public will no doubt some day learn how to build and plant a rock garden. But the writers on horticultural subjects evidently do not think they have learnt yet, and so the flow of works on rock gardening continues. Here is another one by Mr. Thomas, assisted by Mr. S. Arnott.

The book is practical and useful to those who wish to commence a rock garden, but the collaboration of these two gentlemen does not seem to have been quite complete, and there is some divergence of views as to the cultivation of certain plants. For instance, we are told in one place that *Dryas octopetala* likes sandy loam and peat, and in another that it likes lime. Which is the beginner to believe? Some errors as to cultivation are also to be found, notably, for instance, with regard to *Primula Forrestii*, which plant is, in the reviewer's experience, almost indestructibly hardy if planted in well-drained limy soil.

The illustrations of good rock garden building hardly agree with the text, which rightly warns readers against the use of too much rock. Lists are given at the end of the book which might have been compiled with more care. The illustrations are many, and on the whole good. Every variety of rock and wall gardening is dealt with, including the formation of pools, and there are useful chapters on the propagation of alpinists and their care in winter, though *Saxifraga Burseriana* does not need glass. On the whole, a practical work.

"Commercial Orchid-Growing: A Treatise on the Cultivation of Orchids suitable for the Cut Flower Trade, Amateurs, and Market Growers." By C. Alwyn Harrison. 8vo., 132 pp. (Lockwood Press, London, 1914.) 2s. net; 2s. 2d. post-free.

This neat little book of fifteen chapters is devoted to the useful and interesting subject of growing orchids for market and cut flower purposes.

The claims of the orchid for decorative purposes are well established. Its floral segments are persistent, and consequently not liable to fall or fade rapidly, as do some other flowers. These qualities give a ready demand for the blooms in the market, and already the cultivation of orchids for the purpose advocated has been found remunerative.

In specializing the subject by giving the names of the plants best adapted for growing for cut flowers, together with details of the best method of cultivating them, Mr. Harrison will greatly assist those who wish to embark in the venture, and those who, having already a number of orchids, may be glad to learn how they may make their orchid-growing pay.

The little book will also be useful to all orchid-growers, for the complete cultural instructions and monthly calendar are for general use. The price places it within the reach of all.

"In a City Garden." By J. R. Aitken. 8vo., 107 pp. (Foulis, Edinburgh, 1913.) 3s. 6d. net.

In praise of the deservedly praised Royal Botanic Garden of Edinburgh: a book of the four seasons, their ways in the garden, and the thoughts that came to the author as he traversed its lawns and saw and heard the messages the plants had for him. The author's work has much literary charm, and will, we are sure, bring joy to the many who read it. We wish we could say the same for the few coloured illustrations, but they do not please us. Why should chrysanthemums be pictured against a background composed of a sky-scraper, a factory chimney, and a church tower, or a standard rose with a head many sizes too large for the stem, and flowers out of all proportion to the size of the head? Fortunately the illustrations are few.

The get-up of the book, with its green cover, its ample margins and uncut edges, its ribbon marker and its gilt top, is very pleasing.

"The Small Rock Garden." By E. H. Jenkins. Edited by F. W. Harvey. 8vo., 139 pp. (Country Life, London, 1913.) 2s. 6d. net.

In vain will one look for any particular reference to the small rock garden in this book except in the title. There is a chapter on the Alpine house, which can hardly be called an adjunct to a small rock garden. However, apart from this, the book is a practical guide to rock garden making and planting. Useful lists of plants, their heights and times of flowering, are given, though, as usual in such books, they contain many inaccuracies. *Saxifraga Burseriana gloria* does not need a sunny flank of rock, and might even die in that position.

"Plant Physiology." By Dr. Ludwig Jost; translated by Professor R. J. Harvey Gibson. "Supplement, incorporating the alterations of the second edition of the German original." 8vo., 168 pp. (Clarendon Press, Oxford, 1913.) Paper covers, 2s. 6d. net.

We have already noticed Professor Gibson's excellent translation of Dr. Jost's lectures on Plant Physiology, and it will suffice to say that

this Supplement incorporates all the additions rendered necessary by the advance of scientific investigation and the author's corrections of the first edition. The reading of the book will perhaps be a little awkward, as the Supplement will need to be consulted for every page read, and it would probably have been more convenient (except as regards cost) to have printed the whole work again with the additions and corrections incorporated in their proper places. Albeit, no serious student of plant physiology can afford to be without this valuable book, especially valuable as it expresses not only the opinions of the author but those of other investigators, and gives numerous references to the voluminous literature of the subjects dealt with.

Professor Gibson has in no sense "edited" the book, but has given a clear translation of Dr. Jost's work, adhering as closely to the language of the original as the change from German into English permitted.

"Wild Flowers." By MacGregor Skene, B.Sc. Sm. 8vo., 92 pp. (Jack, London, 1914.) Cloth, 6d. net.

The "People's Books" form a remarkable series of little volumes, apparently designed to take all knowledge for their province, all the English-speaking people into their intimacy. They are well written, deal with an extraordinarily wide range of subjects, illustrated, in some cases profusely, and so cheap as to bring them within reach of the poorest seeker after self-education. The present volume, No. 117 of the series, contains 209 woodcut illustrations, descriptions of two hundred of the commonest wild flowers arranged according to the prevailing colour of their flowers and according to the form of their leaves, with information as to flowering time and habitat, and will prove a most useful guide to a beginner seeking the name of a common wild plant.

"A Course of Practical Work in the Chemistry of the Garden." By D. R. Edwardes-Ker. 8vo., 40 pp. (Murray, London, 1914.) 1s. 6d. net.

This little book presents a series of practical exercises designed to help the horticultural student to understand a little of the science underlying practice in manuring and the making and use of sprays. It is the only book of the kind with this special purpose with which we are acquainted, and we feel sure it will be useful in horticultural classes. The exercises represent an absolute minimum, however, of the work necessary for such students to do, and without a basis of chemical knowledge they will be unintelligible to many.

"The Story of Plant Life in the British Isles." By A. R. Horwood. 8vo., xiv + 254 pp. (Churchill, London, 1914.) 6s. 6d. net.

The intention of this book is to describe examples of all the common British families of flowering plants in simple terms, and to give notes upon the types chosen. Seventy-three photographs illus-

trate the text, and many show the plants referred to, growing in their natural haunts. The intention of the book is excellent, and the publishers have done their work well. The statements made, however, are often very vague, or couched in language difficult to understand, or even seriously at variance with the facts. Almost every page illustrates one or other of these faults; some arise from a desire to use non-technical language; some from a wish to speak familiarly with regard to plants and their ways; some, we fear, from insufficient acquaintance with present-day botany. One or two examples of these faults will suffice. On p. 6 we read " [In spring] a fresh zone of wood is commenced by addition to the exterior in the Dicotyledons, to the interior in the Monocotyledons." P. 11: " It is unlikely that they [climbing plants] were at first erect and have adopted the climbing habit. There is the case of the Ground Ivy, which is a trailing plant, and the Climbing Ivy, which clings to trees." The connexion between the two plants is not at all obvious to the reviewer. On p. 43 we are told the Bulbous Crowfoot (*i.e.* *Ranunculus bulbosus*) has white or green sheaths to the leaves, whereas those of *R. repens* are purple, but no one need seek far to find the reverse is also true. On p. 48, " The corolla [of the Marsh Marigold] is golden yellow; the five sepals are yellow, growing as the petals."

The author announces two further volumes of the series, and we hope, if he publishes them, he will secure the services of some competent and candid friend to revise the proof-sheets for him.

" Physiological Plant Anatomy." By Dr. G. Haberlandt. Translated from the 4th German edition by M. Drummond, B.A., F.L.S. 8vo., 777 pp. (Macmillan, London, 1914.) 25s. net.

The title of this book indicates its importance. Older text-books described the anatomical structures of plants, but physiology was treated as a separate matter for discussion, whereas the cells and tissues have to be constructed with distinct physiological purposes. The book contains fourteen chapters. The first two deal with cells and tissues; the next ten chapters describe the " Systems"—*e.g.* the dermal, mechanical, absorbing, photosynthetic, conducting, storage, aerating, secretory, motor, sensory, and the stimulus transmitting systems; the concluding chapter deals with secondary growth in stem and roots.

Each of these subjects is treated exhaustively, including the latest investigations.

As the whole book, including Notes (fifty pages) and Indexes (fifteen pages), comprises 777 octavo pages, it would be impossible to give a detailed account of each chapter. It is the physiological uses and adaptations of cells and tissues wherein the great value and interest lie; and no student should fail to study this work till he has mastered it. There is one matter to which we must refer, and that is the author's adoption of Kerner's theory of girders. The vascular bundles

of a stem are regarded by him as the "flanges," but the connecting piece, called the "web," is wanting (fig. 55, p. 166). To resist a *lateral* strain, as by wind, the opposite flanges should be united by strong webs. As an example, a train runs on the upper flange of the rail girder; but if the vertical iron web supporting it were weak it would be crushed. This is exactly what takes place in a hurricane with slender stems; the force is at right angles to the vascular cord, and crushes them inwards. When all the cords are united laterally, a hollow cylinder is secured; this constitutes a "continuous arch," every point being a top. Nature then unites the whole by diaphragms. Kerner's theory was submitted to an engineer, and he thoroughly disapproved of it. The web (corresponding to the pith) of an iron cylinder is always filled with solid concrete. It may be mentioned that in all dicotyledons, except those with opposite leaves, no two of the principal vascular bundles can be on the same diameter.

"Flowers." By J. Foord. 8vo., 68 pp. (Batsford, London, [1914].) 2s. net.

A new series of books under the title "Fellowship Books" is in course of publication, and this is one of them. It is a pleasantly written book, having for its central idea the many-sided appeal flowers make to human beings. It is unlikely that one will agree with all the author says, as, *e.g.*, when he deals with flower colours and tells us "Nature really knows best," and that those colours saved by man's selection, not by Nature's, are always least pleasing. Surely sometimes he says such things as this because he is ignorant of the wild types from which our garden flowers have sprung, for red sweet peas are no more unnatural than are the pink ones he praises. The essay is full of stimulating thought, but not of unrest: the type and paper are excellent: the whole book a pleasure to read.

"Unsere Freiland-Nadelholzer." By Ernst Graf Silva Tarouca. Large 8vo., 302 pp. (Tempsky, Vienna; and Freytag, Leipzig, 1913.) M. 18.70.

Conifers have long had many admirers among the gardening community both in England and abroad, and a book of this kind, dealing as it does with their uses in various positions, with their characteristics, and with the typical Conifers of different parts of the world, will be welcomed.

The book is divided into a general account of the Conifers, and a special one of their classification, both botanical and horticultural.

In the former appear chapters on the use of Conifers in the park by E. Graf Silva Tarouca, and in the garden by Camillo Schneider, who also contributes an account of the insect and fungus enemies of the Coniferae, and a glossary; on Chinese Conifers by E. H. Wilson; on Conifers of North America, by A. Rehder; on the cultivation and propagation of Conifers, by F. Zeman, and upon other matters.

The latter part gives, in addition to a botanical classification, lists arranged according to colour, height, growth forms and the like, of great value to the horticulturist.

Dealing as it does with the Conifers which prove hardy in Central Europe, practically all the plants referred to are hardy in Great Britain, and this increases the value of the book to British readers.

The excellent illustrations, of which at least one appears on every page, are a feature of the book, and the examples chosen for illustration are as a rule from Continental gardens or native habitats, and will be for the most part new to British readers. The six folding plates of cones are particularly valuable, bringing together as they do one of the most reliable classificatory characters.

It is a pity no index is provided, especially as the plates and illustrations are not infrequently considerably removed from the letterpress in which reference is made to them.

"Wild Flowers as they Grow." By H. Essenhugh Corke and G. Clarke Nuttall. 8vo., viii + 200 pp. (Cassell, London, 1914.) 5s. net.

We have already referred to earlier volumes of this series, and what was said in those earlier notices applies to the present volume, the sixth. The coloured plates are, as a rule, faithful representations of the plants they portray; the letterpress is readable, informative, and usually accurate.

"Flowering Plants of the Riviera." By H. Stuart Thompson, F.L.S. 8vo., xxix + 249 pp. (Longmans, Green, London, 1914.) 10s. 6d. net.

To this useful book Mr. A. G. Tansley, M.A., contributes an introduction on the types of vegetation characteristic of the Riviera, and then follow descriptions of the principal plants met with in the district, 1800 species in all being described. Small coloured figures illustrate 112 of them, and there are also sixteen photographs of vegetation. The descriptions appear to be complete enough to enable one to identify plants met with on rambles in the district, and the book will prove a valuable companion to those who seek to know the plants they meet with on their visits to the Riviera.

"A Flora of Norfolk." Ed. by W. A. Nicholson. 8vo., vii + 214 pp. (West, Newman, London, 1914.) 6s. net.

The past few years have seen a recrudescence of the activities of botanists in producing local floras, somewhat similar in intensity to those of fifty years ago. 1866 saw the publication of Trimmer's "Flora of Norfolk," and since that date many new facts have been recorded, especially in the "Transactions of the Norfolk and Norwich Naturalists' Society," and they, together with old records, have been collected in the present volume. Except to say that the lists appear

to have been compiled with care, the general body of the book, which records an enormous amount of work, calls for no special mention. Mosses and Hepatics are included, but not Fungi or Algae. Mr. A. W. Preston contributes a chapter on "Climate," Mr. L. F. Newman one on "Soils," and Mr. W. H. Burrell gives a particularly interesting account of the physiography of the county and the distribution of plants in it.

"Phytogeographic Survey of North America." By J. W. Harshberger. 780 pp., 1 map, 18 plates, and 32 figs. (Engelmann, Leipzig, 1911.) Price £2 12s.

This volume of the memoirs, "Vegetation der Erde," is written in English. It gives a summary of the historical development of Botany in North America, an account of the topography and climate, and a discussion of the geological evolution of the flora. The main thesis is a description of the regions of vegetation, from the Arctic through the various temperate zones to the tropical regions of Panama and the West Indies. In spite of almost unwieldy size, the memoir is a severe condensation of the immense amount of work done on regional plant geography in America; the bibliography of titles alone extends to 46 pages. Many American species are referred to and are easily found in the index, little detail is given on floristic characters, but the interest to horticulturists lies in the description of the type of vegetation to which each species belongs. As North America extends through many kinds of climate from Arctic to tropical and from its Atlantic coasts over the Rockies to the characteristic Pacific region, the number of plant formations dealt with is bewildering, but the author has carefully delimited the more extensive types of vegetation and has thus presented them in a form not hitherto attempted. The phytogeographic areas are shown on a coloured map, and the photographs reproduced as plates or figures convey a good impression of characteristic plants in their surroundings.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* renders subsequent reference to the original easy. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.
2. To place next the name, when given, of the author of the original article.
3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 453, 454.
4. After this, a reference to the number, date, and page of the journal in question.
5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
IN THIS WORK.

Baker, F. J., A.R.C.S., F.R.H.S.
 Ballard, E., F.R.H.S.
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 Chittenden, F. J., F.L.S., F.R.H.S.
 Clayton, G. P., F.R.H.S.
 Cooke, M. C., M.A., I.L.D., A.L.S., F.R.H.S., V.M.H.
 Cotton, A. D., F.L.S.
 Darlington, H. R., F.R.H.S.
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 Henslow, Rev. Professor Geo., M.A., F.L.S., F.R.H.S., V.M.H.
 Hodgson, M. L., F.R.H.S.
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 Pethybridge, G. H., B.Sc., Ph.D., F.R.H.S.
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 Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
 Simmonds, A., F.R.H.S.
 Smith, William G., B.Sc., Ph.D., F.R.H.S.
 Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
 Voss, W. A., F.C.S., F.R.H.S.
 Webster, A. D., F.R.H.S.
 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales . . .	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope . . .	Agr. Jour. Cape G.H.
Annales Agronomiques . . .	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault . . .	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort. . .	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles . . .	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg . . .	Ann. Jard. Bot. Buit.
Annals of Botany . . .	Ann. Bot.
Beih. zum Botanischen Centralblatt . . .	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura . . .	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana . . .	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticoltura . . .	Boll. R. Soc. Tosc. Ort.
Botanical Gazette . . .	Bot. Gaz.
Botanical Magazine . . .	Bot. Mag.
Bulletin de la Société Botanique de France . . .	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret . . .	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France . . .	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane . . .	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne . . .	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica . . .	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad . . .	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations . . .	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie . . .	Cent. f. Bact.
Chronique Orchidéenne . . .	Chron. Orch.
Comptes Rendus . . .	Comp. Rend.
Contributions from U.S.A. Herbarium . . .	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria . . .	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand . . .	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées . . .	Dict. Icon. Orch.
Die Gartenwelt . . .	Die Gart.
Engler's Botanische Jahrbücher . . .	Eng. Bot. Jah.
Gardeners' Chronicle . . .	Gard. Chron.
Gardeners' Magazine . . .	Gard. Mag.
Gartenflora . . .	Gartenflora.
Journal de la Société Nationale d'Horticulture de France . . .	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agricult. Victoria . . .	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies . . .	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Science . . .	Jour. Agr. Sci.
Journal of Botany . . .	Jour. Bot.
Journal of Chemical Society . . .	Jour. Chem. Soc.
Journal of Economic Biology . . .	Jour. Econ. Biol.
Journal of Economic Entomology . . .	Jour. Econ. Entom.
Journal of Genetics . . .	Jour. Gen.
Journal of Horticulture . . .	Jour. Hort.
Journal of the Board of Agriculture . . .	Jour. Bd. Agr.
Journal of the Linnean Society . . .	Jour. Linn. Soc.
Journal of the Royal Agricultural Society . . .	Jour. R.A.S.
Journal of the Society of Chemical Industry . . .	Jour. Soc. Chem. Ind.
Journal S.E. Agricultural College, Wye . . .	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte . . .	Kais. Ges.
La Pomologie Française . . .	Pom. Franç.
Le Jardin . . .	Le Jard.

Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Actinidias, Some Asiatic. By D. Fairchild (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 110; Jan. 1913; figs.).—Notes on the following species of Actinidia, and the value of their fruits for eating in the United States, are given: *Actinidia arguta* Miq. (tara or wild fig of Korea), *A. callosa* Lindl., *A. polygama* Miq., *A. kalomikta* Ruprecht, *A. chinensis* Planch. (yang-taw of China). The difficulty of obtaining fruit in cultivation is largely due to the plants being dioecious.

F. J. C.

Alfalfa Inoculation Tests. By C. W. Pugsley (*U.S.A. Exp. Stn., Nebraska, Bull.* 136; April 1913; figs.).—Records the results of co-operative tests with nodule bacteria cultures, and reports that better results were obtained by inoculation with soil from old alfalfa (lucerne) fields than by the use of liquid cultures.—F. J. C.

Alisma, Hybrids of. By Professor Dr. H. Glück (*Beih. Bot. Cent.* xxx., Abt. 2, Heft 2 pp. 124-137; 2 plates and 24 figs.).—This paper gives a very full description with copious illustrations of the hybrids (both ways) of *Alisma Plantago* and *Alisma* (or *Echinodorus*) *ranunculoides*. The *A. Plantago* × *ranunculoides* form was found by him at Holland Arms, Anglesey, Turlochmoor, and between this and Tuam in Ireland, was also seen in Marshall's herbarium (Fearn and Balintone) from Scotland. It is very like *Plantago* in inflorescence, flower, carpel, and fruit, but the fruit wall is intermediate.

The *ranunculoides* × *Plantago* hybrid in branching, peduncle, carpel, and fruit resembles *ranunculoides*.—G. F. S. E.

Alpines, Mulching of (*Garden*, March 8, 1913; p. 120).—In many parts of the country alpine plants suffer much from the parching March winds. Mulching with small chips, gravel, or rough grit 1 to 2 inches deep has given wonderfully beneficial results. The mulch should be added gradually, so as to allow the plants to grow up among the material.—H. R. D.

Apple Blotch, Control of. By D. E. Lewis (*U.S.A. Agr. Exp. Stn., Kansas, Bull.* 196, Dec. 1913, pp. 521-574; 21 figs.).—This disease is caused by a fungus (*Phyllosticta solitaria*) which attacks twigs, leaves, and fruit. Spraying tests during seasons 1910-1913 were carried out with marked results. Bordeaux mixture (3 lb. bluestone, 4 lime, 50 gallons water) was found to eradicate the disease from orchards in from four to six years if spraying is done with thoroughness. Pruning was also of considerable value.—A. B.

Apple Fruit-spot, The Jonathan. By W. M. Scott and J. W. Roberts (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 112; Feb. 1913; pp. 11-16; 2 figs.).—This is considered to be a new fruit-spot of the apple, the 'Jonathan' being the most susceptible variety, the 'Spitzenberg' almost as much so, and the 'Yellow Newtown' ranking third in this respect. The spots are seldom more than skin-deep, dark brown in colour, more or less circular in outline, from one-eighth to three-fourths of an inch across, at first scarcely depressed, but later becoming considerably sunken. The disease only occurs on fully-matured fruit, and usually develops after the crop is picked. Fruit gathered at the proper time, or rather early, rushed into cold storage with only two or three days' delay, and consumed within a few days after removal from storage, does not develop the disease to any serious extent. Fruit of susceptible varieties kept in common storage, or delayed in reaching cold storage, usually becomes affected. Investigations seem to have disposed of the theory that the spot is due to spraying with arseniate of lead. Nearly 400 cultures of the diseased spots have been made in various ways and on various media, but no organism has been isolated with any degree of consistency. It is considered to be a physiological trouble falling in the same category as the bitter-pit or Baldwin spot.—*A. P.*

Apple Leaf-hopper. By L. Haseman (*Jour. Econ. Entom.* vi. p. 240; April 1913).—The author finds that, contrary to the general belief, this insect (*Empoascus mali*) passes the winter as an imago among rubbish. There are several broods, and the first usually curls the leaves badly. Spraying does not seem to keep it in check effectively, but an adaptation of the sticky shield arrangement led to the capture of large numbers. It was apparently used only on quite young trees.—*F. J. C.*

Apple Leaf-miner, The Unspotted. By L. Haseman (*Jour. Econ. Entom.* vi. p. 313; June 1913).—This insect (*Ornix geminatella*) does considerable damage in some seasons, four or five broods occurring, but it is not usually a serious pest.—*F. J. C.*

Apple 'Tardive de Vogelsang' (*Rev. de l'Hort. Belg.* Feb. 15, 1913, p. 56).—This new apple, shown by M. F. Lambeau at a meeting in Brussels, is a vigorous grower, very prolific, the fruit is delicious, and the tree is said to be proof against woolly aphis.—*M. L. H.*

Apple Varieties in Ohio, Disease Susceptibility of. By A. D. Selby (*U.S.A. Agr. Exp. Stn., Ohio, Cir.* 133, April 1913, 4 pp.).—This paper gives a list of thirty-eight varieties of apples with the degree of susceptibility to the following diseases: Crown gall, collar rot, blister canker, twig blight, scab, bitter rot, blotch, black rot, fruit spot, Baldwin spot.—*A. B.*

Apples from the Crimea. By E. A. Meyer (*Gartenflora*, vol. lxii. pt. xxii. pp. 489-491).—‘Sary Sinap’ is extensively grown on the coast of the Black Sea and in the north of the Crimea as a dessert Apple. The barrel-shaped fruit is gathered in September and is fit for use in November. The freshly gathered Apples are green, but change to yellow when ripe. This Apple is a robust grower, but does not bear large crops before its fifteenth year. It generally comes true from seed. It is seldom attacked by insects or by disease, and is free from American blight.

‘Kandil Sinap’ has a finer flavour than ‘Sary Sinap.’ The fruit is wedge-shaped and has a fine red colour. The harvest begins in August and the Apples keep till February. It is a robust grower; forming tall pyramids which are laden with fruit. The branches are supported by stakes in July to prevent the wind bringing down the crop, as the Apples are heavy and their stalks are thin.—S. E. W.

Asparagus Beetle, A Parasite of. By H. M. Russell and F. A. Johnston (*Jour. Econ. Entom.* v. p. 429; Dec. 1912).—The life-history of *Tetrastichus asparagi* is detailed. The parasite lays its eggs in those of the asparagus beetle, and the larvæ develop in the larvæ of the asparagus beetle. The adult parasite also does much good by feeding upon the eggs of the beetle.—F. J. C.

Asparagus plumosus, Sensitive Life of. By F. C. Newcombe (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 1, pp. 13-42).—Seedling shoots grow to a height of 10-15 cm., and then bend the last 3-5 cm. into a horizontal or plagiogeotropic position. These seedling shoots, when grown in the dark, still do this, and their lateral buds unfold. Twining shoots from rhizomes grow erect for 40-60 cm. and then twine, rising for one to several mètres. They then become horizontal and the buds unfold. All their branches take the same horizontal or diageotropic position. If grown in the dark they do not twine but grow directly upwards, even for 200 cm. or more. If placed in the dark after being in the light they can for at least eight days take the diageotropic position, but cannot do so if never exposed to the light.

The horizontal or oblique position is an effect of gravity (diageotropism), not of light; but all kinds of shoots are positively heliotropic.

They make a complete revolution in from two to eight hours, which may be either clockwise or in the opposite direction. When placed in the dark they stop twining in three days.

On the klinostat, diageotropy is not manifested and the branches develop like those of *A. officinalis*—that is, when the klinostat axis is horizontal and the light is equalized.

The spinous nodal scales of the main axis are used in nature as hooks to support the shoot, and they develop equally well in darkness.

The buds unfold in seedling shoots grown in the dark, possibly

because of lack of nourishment ; they do not do so in etiolated rhizome shoots.

The unfolding of the buds has nothing to do with the horizontal bending over of the shoot.

The straight upward growth in darkness and the absence of branches and presence of spines enable the shoot to make its way up into the light. Then it begins to twine, and the bending over of main stem and branches will expose the assimilating parts to light.—*G. F. S. E.*

Azaleas, Some New. By P. (*Rev. Hort. Belg.* June 15, 1913, p. 195 ; plate).—At the exhibition at Ghent last year some new Azaleas were shown by Messrs. Haerens, of Somerghem, which obtained numerous prizes.

These novelties included 'Mme. Aug. Haerens,' 'Lady Roosevelt,' 'Brillanta Belgica,' 'Windfried Haerens,' which are here described, and are said to be of great value.—*M. L. H.*

Bacteria, Testing Cultures of Nodule-forming. By Karl F. Kellerman (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 120 ; April 1913 ; pp. 3-5).—A plausible explanation of the occasional failure of cultures of *Bacillus radicicola* to inoculate a crop properly is that the bacteria, though able to grow vigorously in the culture medium, have actually deteriorated in the essential quality of being able to infect the leguminous roots and produce nodules. This paper describes a method of testing the inoculating power of apparently identical strains of bacteria.—*A. P.*

Banana, Inflorescence and Flowers of. By Paul Baumgartner (*Beih. Bot. Cent.* xxx. Abt. 1, Heft 3, pp. 237-368 ; 1 pl. and 26 figs.).—In this detailed study the flowers, fruits, and inflorescences of *Musa Ensete*, *M. Cavendishii*, *M. sapientum*, *M. rosacea* (?), *M. discolor*, and other species were used. The author finds four types of flower : female fertile, male sterile, a third type with both stamens and carpels functional, and a fourth, neutral or sterile type, which is found at the end of the inflorescence of *M. Cavendishii*, and which is like the male flower but with no pollen.

The more primitive type of dry fruit (*M. Ensete*) with seeds only arises after pollination. In the next lower series, or "hands," the ovaries grow for a shorter or longer time without seed formation and then wither. In the undermost series the growth lasts longer and the fruit remains green and sappy, being larger than the normal fruit, but the seed rudiments do not develop.

In the edible bananas the first type is absent, the second is present, but in the third, which is represented only, the ovule rudiments are either never formed or are reabsorbed. They do not require pollination.

The author shows that the form of the groups of flowers at different parts of the inflorescence depends upon space restrictions during growth (between bract and apparent stem). The lower part receives more nourishment than the upper.

The embryo flower (sterile) of *M. Ensete* is at first actinomorphic with all the circles of three members represented (in principle that of the Tulip), but the mature flower is zygomorphic with the number of members unlike in different circles of the same flower. In other species the flower is from the first zygomorphic.

The primordial rudiment of the fertile flowers is more favourably situated and larger than that of the sterile flower. The size of the median inner stamen seems also to be regulated by the form of the cross-section of the flower and by the degree of interference or restriction during development.

The pollen of *M. Ensete* germinates whilst still in the anther; the pollen formation and even the number of chromosomes seem to be variable in some cultivated varieties.

The excentric position of the style is due to the unequal growth of the flower; in consequence of this, the openings or honey-canals are formed. The number of ovules is greatly increased in the more specialized species. The nectaries are believed by the author to be rudiments of a second circle of carpels.

The author lays special stress on the effects of restriction during growth upon development; this is produced by the peculiar arrangement of the bracts and inflorescence.

There are many other details regarding the structure of the banana flower, for which reference must be made to the original.—*G. F. S. E.*

Bean, The Production of the Lima. By G. W. Shaw and M. E. Sherwin (*U.S.A. Exp. Stn., Berkeley, Cal., Bull.* 224; Nov. 1911).—There is a total acreage of about 82,850 acres devoted to the Lima Bean (*Phaseolus lunatus*) in California, which produced 1,160,000 sacks of beans in 1910. Land which is known to be suitable to the cultivation of the Lima Bean fetches special prices. The area of its profitable cultivation is limited to a certain extent by soil, as it is intolerant of alkali, for instance; but a more important factor is climate. It suffers more from frost than the common kidney bean even, and as it is a late-maturing plant it is often caught in the Eastern and Northern States by early autumn frosts, and in California by early autumn rains, which cause a portion of the crop to rot in the field.

The writers seem specially anxious to bring out that while cultural methods at present practised in California are all that could be desired, there is much need for more rigorous seed selection.—*M. L. H.*

Berberis Darwinii and others. By S. Mottet (*Rev. Hort.*, pp. 525-7, Nov. 16, 1913; coloured plate and 1 ill.).—An interesting article on the tribe generally, with list and descriptions of the best. The coloured plate shows three varieties: *B. Darwinii*, orange yellow *B. stenophylla Irwinii*, bright yellow; and *B. s. corallina*, bright red.

C. T. D.

Blackberry, The Himalaya. By H. P. Gould (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 116; March 1913; pp. 23-26).—The exact botanical identity of this blackberry appears not to have been determined. The canes are perennial and do not die back each year after the fruiting period. Reports are given from a number of growers who have tried it, and only one represents it as successful. In most places it seems to be deficient in hardiness, productiveness, and quality.—*A. P.*

Blueberry Culture. By F. V. Coville (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 122; April 1913; pp. 3-11).—*Vaccinium corymbosum* is the species chiefly desirable for cultivation, which, though known as the swamp blueberry, does not thrive in a permanently wet soil. Directions are given for propagation by a layering process known as "stumping," and by tubering. Success in blueberry culture depends especially on the satisfying of two requirements—an acid soil, and a root fungus that appears to have the beneficial function of supplying the plant with nitrogen. This subject is discussed at length in Bulletin 193 of 1911—"Experiments in Blueberry Culture." Only a beginning has been made in the improvement of the fruit, but berries eleven-sixteenths of an inch in diameter have already been produced, and it is expected that from the better wild stocks now available berries of still larger size will be developed.—*A. P.*

Bulb-growing, Experiments in the United States Bulb Garden. By P. H. Dorsett (*U.S.A. Dep. Agr., Bull.* 28; Nov. 1913; figs.).—Instructions on and results of experiments in the growing of hyacinths, narcissi, and tulips. About one million dollars' worth of Dutch bulbs is imported into the United States annually, and endeavours are being made to devise successful methods of growing these in the States.—*F. J. C.*

Caladenias. By R. Schlechter (*Orchis*, vol. viii. pt. i. pp. 3-8; 1 col. plate).—Some thirty varieties of *Caladenia* are found in Australia. The difficulty of their cultivation has been over-rated. Plant the bulbs in rather deep seed-pans containing a mixture of leaf-mould, sand, and a little loam, adding the soil in which they were packed. Water sparingly in spring and more abundantly in summer. Grow in a cool house. *Caladenia alba* bears one to three flowers. The narrow pointed sepals and petals are white. *C. carnea* differs from the above in the rose colour of the sepals and petals. *C. aphylla* bears a white flower suffused with violet before the leaves appear. *C. coerulea* has blue flowers. *C. deformis* resembles the preceding, but is slightly hairy and the flowers are larger. *C. discoidea* has a hairy stem with greenish-yellow petals suffused with brownish-red; *C. filamentosa*, thin hairy leaves with brown flower; *C. flava*, golden-yellow flowers with purple spots. *C. hirta* has a tall stem with two or three white or pink flowers; *C. gemmata*, oval hairy leaves, blue flowers; *C. latifolia*, hairy lance-shaped leaves, long stem with two

or three rose-coloured flowers. *C. Menziesii* bears one to three white flowers. *C. Patersonii*, yellowish-pink with brownish-purple tips. *C. reptans*, hairy leaves, underside purple; the flower resembles *C. latifolia*. *C. sericea* has hairy leaves and stem; the flowers are blue. *C. testacea* bears a pale-blue flower on a slender stalk; it resembles *C. carnea* in many respects.—S. E. W.

Campanulas or Bellflowers. By S. Arnott (*Garden*, 1913, pp. 433, 445, 473, 483, 496, 524, 534, 536, 550, and 562).—This is an interesting and useful review of the garden Campanulas which does not lend itself conveniently to abstracting.—H. R. D.

Cedar Woods.—By W. Dallimore (*Bull. Roy. Bot. Gard. Kew*, 1913, No. 6, pp. 207–224).—The frequency with which the word “cedar” is used in connexion with various kinds of timbers led the author to compile a list of the trees to which the name is applied. There appears to be little doubt that the name was originally applied to the Cedar of Lebanon, *Cedrus Libani* Loud., which is the most widely known Cedar of the present day, although its wood is one of the least important of the many which now bear the name of Cedar. The chief reason for the adoption of the name for many kinds of woods appears to be that they possess an odour very like that of the Cedar of Lebanon, but in other cases a real or fancied resemblance between the leaves or the bark of the two trees has been found a sufficient reason for the name. Then again the name appears to have been given to some woods in order to try to create a market for the timber, whilst in other instances there does not appear to be any good explanation for the use of the word. From these several reasons the name of Cedar has been brought into use for trees and woods which are totally distinct in habit and structure, belonging to widely separated families, and coming from many different parts of the world. The list contains no fewer than fifty-seven species, belonging to fifteen Natural Families. A note on the habit of the tree and the value of this wood is given in each case.—A. S.

Chestnut Bark Disease. By H. Metcalf (*U.S.A. Dep. Agr. Year Book* 1912, pp. 363–372; 1 col. plate, 3 other plates).—This disease is caused by *Endothia parasitica* (Murr.) and gives rise to a concentrically spreading canker, which soon encircles the trunk and so kills the tree. Apparently the fungus does not penetrate below ground to any great extent. Conidia and ascospores may be conveyed either by animals or wind to healthy trees, and enter the trees by slight wounds in the bark. The author advocates strict inspection of chestnut trees, and suggests attempting to produce species immune from this disease by crossing American species with Asiatic species.

A. B.

Children's Garden Work, Some Types of. By Miss Susan B. Sipe (*U.S.A. Exp. Stn., Bull.* 252, Dec. 5, 1912; 11 pl. and 2 figs.).—This book describes the work done in connexion with school gardens

in several cities in U.S.A. The descriptions are very full and contain much interesting and valuable matter.

The reports on vacant-lot gardening in Minneapolis and school gardening in connexion with Utah State Normal Training School contain many suggestions calculated to help a teacher to connect his school gardening with home gardening.

The report on Greeley, Colorado, contains a scheme of instruction for teachers in Nature Study and Elementary Agriculture.

The diagram on p. 38, showing the relation of soil to living, is extremely good and worth copying.—*W. W.*

Chinese Cabbage, Pe-Tsai, The. By S. Mottet (*Rev. Hort. de l'Alg.* March 1913, p. 118).—A note taken from *L'Agriculture Nouvelle* on the Pe-Tsai (*Brassica chinensis*). This vegetable, which was introduced into Europe as early as 1855, has been the subject of numberless experiments and articles, but is little cultivated among us nowadays. In the East, however, it occupies an even more important place as an article of food than the descendants of the *Brassica oleracea* do in Europe.

The Pe-Tsai does not "heart," and in appearance is really more of a cos lettuce than a cabbage. It is eaten green, either cooked or raw, in salads, and the advantages claimed for it are—early maturity, quick development (which makes it possible to harvest a double crop in the year), its comparative hardiness, and the fact that it may be eaten at all stages of its growth. This allows of thick planting and the utilization of all successive thinnings.—*M. L. H.*

Chlorophyll, Constitution of. By Julius Stoklasa, Johann Šebaf, and Emanuel Senft (*Beih. Bot. Cent.* xxx. Abt. 1, Heft 2, pp. 167–235; 10 pl.).—In this important article Stoklasa maintains his views regarding the structure of chlorophyll; the phosphorus which he considers to be an essential element in chlorophyll becomes insoluble in alcohol or ether if dried leaves are used. This explains the results of Willstätter and others. Chlorophyll always contains from 14 to 15.4 per cent. of phosphorus (dry weight of the extract). He describes also the chemical constitution of various chlorophyll extracts, some obtained commercially and others from fresh leaves of nettle, grasses, wheat, *Tanacetum*, *Galeopsis*, &c.

He concludes that chlorophyll consists of three different sorts of complexes: (a) Phaeophorb and metal groups soluble in alcohol and ether; (b) Phaeophytin, soluble in petrol ether; and (c) Chlorolecithins, which are unions of either of these with phospho-glycerides. Magnesium is one of the above metals and accompanies phosphorus.

The colour change of leaves in autumn is a hydrolytic breaking up of chlorophyll with separation of phaeophytin and phosphatides. These are brown in colour, and allow the yellow and red of Xanthophyll and Carotin to appear. Lecithins are not combined, but mixed with the chlorophyll.

By culture experiments which are fully detailed the authors show that both phosphorus and magnesium are necessary elements for the growth of plants, although only in very minute proportion. The plates and calculations of amount of these substances in the various cultures bring this out clearly.—*G. F. S. E.*

Chrysanthemums. By H. Koehler (*Gartenflora*, vol. lxiii. pt. ii. pp. 49–51; 3 figs.).—The following Chrysanthemums, mostly single, are recommended: 'Rosenelfe,' lilac pink; 'Ceddie White,' gold with bronze tips; 'Dorothy Dann,' salmon-bronze; 'Golden Parasol,' anemone, flowered gold; 'Gaiety,' gold bronze; 'Dr. G. Barré,' purple; 'Ami Jose Barré,' white; 'Radium,' bronze red; 'Gerbe d'Or,' pale yellow; 'Baronne de Vinols,' pink; 'Victoria,' nankeen; 'Mrs. R. N. Parkinson,' bright yellow; 'Polly Duncan,' apricot; and 'Lugano,' carmine.—*S. E. W.*

Chrysanthemums, Pests and Diseases of (*Rev. de l'Hort. Belg.* March 31, 1913, p. 103).—Some recipes to be used in Chrysanthemum growing:—

1. For *Septoria Chrysanthemi*:

Pentasulphuret of potassium	3 grammes
Permanganate of potash	$\frac{1}{2}$ gramme
to 1 litre of water.	

To be used once a week, to be followed by a vigorous application of yellow sulphur or sulphur and nicotine.

2. For *Rust* after it appears:

Pentasulphuret of potassium	3 grammes
Permanganate of potash	$\frac{1}{2}$ gramme
Formic aldehyde (Formol)	$\frac{1}{2}$ gramme
to 1 litre of water.	

Brush the foliage with this solution or soak the plant in a bucket of it. Blow yellow sulphur over it while the plant is wet. This has proved a sovereign remedy.

To prevent the fungoid diseases which attack chrysanthemums, water whatever shelter they are to go under with a solution of $\frac{1}{2}$ gramme permanganate of potash to 1 litre of water, and when the plants are put under cover, water the surface of the pots with the same mixture. This sterilizes the surface of the pots, and in penetrating into the soil oxidizes the compost, thereby helping the roots to assimilate the manure.

A good and cheap insecticide may be made as follows:—

Soft soap	1 kilo
Methylated spirit	1 litre
Hypochlorite of soda at 3° Baumé	1 litre
Sapocresol	1 litre
Phenic acid	1 litre
Ammonia	200 grammes.

One litre of this mixture to 100 litres of water. 1 in 25 of this insecticide is a good treatment for woolly aphids.—*M. L. H.*

Cockroaches, A Trap for. By F. L. Washburn (*Jour. Econ. Entom.* vi. p. 327 ; June 1913 ; one fig.).—The trap consists of a conical glass flask having a paper cone with the small end innermost, held in its mouth by means of vaseline. A smaller cone is glued inside this. The trap is baited with banana peel, and is said to be very effective.
F. J. C.

Codling Moth, A Brood Study of. By T. J. Headlee (*Jour. Econ. Entom.* vi. p. 389 ; Oct. 1913).—The author shows there are three broods of this moth in New Jersey each year, the third late one being a small one.—F. J. C.

Cotton, Egyptian, as Affected by Soil Variations. By T. H. Kearney (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 112 ; Feb. 1913 ; pp. 17-24).—This plant is decidedly sensitive to variations in its physical environment. Differences in the texture, and consequently in the moisture-holding capacity of the soil, are easily detected by the differences in the size, appearance, and fruitfulness of the plants, in the size of the bolls, and in the quality of the fibre, the uniformity of the fibre in staple, strength, and other qualities, being of the utmost importance. The soil must have a sufficient water-holding capacity to prevent the plants suffering as a result of drought between irrigations, for where this happens the bolls are few and small and the fibre inferior. The presence of alkali salts in the soil also induces marked differences in the growth and behaviour of the plants, though Egyptian cotton is considered superior to many other plants in its ability to endure an excess of salts in the soil, fair yields of fibre of good commercial quality being obtained where nearly one-half of one per cent. of the total dry weight of the soil consists of readily soluble alkali salts, provided that carbonates ("black alkali") are absent or nearly so. New land as a rule should be avoided, owing to its probable variation in moisture capacity.—A. P.

Cotton Seedlings, Leaf-cut, or Tomosis, a Disorder of. By O. F. Cook (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 120 ; April 1913 ; pp. 29-34).—This is characterized by mutilation of the leaves and abortion of the terminal buds, and is readily distinguishable from the distortion caused by plant lice. It is in the nature of an environmental injury, not due to parasitic organisms or constitutional weakness, but apparently connected with exposure to heat and dryness, all varieties of cotton being susceptible in the early stages of growth. Damage can be avoided or reduced by improved cultural methods as detailed in previous publications.—A. P.

Cucumber Rot. By O. F. Burger (*U.S.A. Agr. Exp. Stn., Florida, Bull.* 121, Febr. 1914, pp. 96-109 ; 6 figs.).—A bacterial disease of cucumbers which attacks both fruit and leaves. In the fruit white spots, turning into watery vesicles, are formed. These spots grow inwards, not laterally, and ultimately convert the fruit into a soft

watery mass. A specific bacillus has been isolated and cultivated on various media and has caused the disease on healthy plants. It is assigned the number 222.3332113 in chart of the Society of American Bacteriologists. Various spraying experiments were carried out with Bordeaux mixture (4 lb. bluestone, 6 lime, 50 gallons water strength) with fairly satisfactory results. Nitrate of soda is not suitable for cucumbers, as it renders them more susceptible to this disease.—A. B.

Custard Apple, The. By R. A. Davis (*Agr. Jour. Cape G. H.* vol. vi. No. 2, pp. 372, 373, Aug. 1913; pl.).—The tree succeeds in the warmer districts of the Transvaal, Natal, and Cape Provinces. It grows readily from seed, but cannot be depended upon to reproduce itself true, therefore grafting is largely employed. Scions are inserted in the stocks and the whole covered over with soil, much as the Western Province farmer propagates his grape vines. Liquid cow manure appears to be the best dressing, together with a complete fertilizer applied biennially. The fruit is supposed to be one for which a taste must be acquired, but Mr. Davis says "there is no need to acquire a taste for it; the taste is here, but sufficient of the fruit to gratify it is absent." It is possible that the export of the fruit will develop at a future date, since the custard apple can be sent with success from South Africa to almost any part of the world.—A. A. K.

Cypress, A New. By George Barron (*Rev. Hort. de l'Alg.* Aug. 1913, p. 309).—A new Cypress belonging to the group *Cupressus sempervirens* has been observed in Tunis. This variety, to which the name *C. sempervirens numidica* has been given, has proved in the mountains of Central Tunis to be very drought-resisting, and to be proof against fire and native depredations. It is concluded that in it Tunis possesses both an interesting and a useful conifer. The tree is described as easily recognizable by its manner of growth. The branches start vertically and then turn outwards and finish their growth horizontally. In consequence it makes a much larger and denser head than other varieties of Cypress.—M. L. H.

Cytase, The Excretion of, by *Penicillium pinophilum*. By K. F. Kellerman (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 118; March 1913; pp. 29-31; 2 figs.).—The biological activities of several species of bacteria and moulds are usually considered a satisfactory explanation of the destruction of the greater portion of the cellulose annually deposited upon the soil, though the existence of true cellulose-dissolving enzymes or cytases has not been so generally accepted. The writer of this paper describes a method which has been developed, which he considers adequate, for demonstrating that cytases produced by aerobic fungi, slowly diffusible through agar, may exist even when separated from the living organisms which produced them.—A. P.

Damping-off Disease in Plant Beds, Control of. By James Johnson (*U.S.A. Agr. Exp. Stn., Wisconsin, Research Bull.*, March 31, 1914, pp. 24-61; 12 figs.).—This paper is devoted to the control methods of damping-off caused by *Pythium Debaryanum* (Hesse), though they would equally apply in the case of damping-off caused by *Rhizoctonia* fungus. Damping-off fungus occurs on numerous food plants and garden and greenhouse plants, and may also live on dead organic matter of the soil. The disease is especially favoured by excessive moisture and high temperatures. Of a large number of chemical substances tried, formalin alone proved of value. The author recommends formalin (1 in 50 parts of water) at rate of 2 quarts to the square foot of soil. This suffices to kill fungi and is also beneficial to the plant. Sterilization of the soil by heat was, however, the most satisfactory method of dealing with the disease. This sterilization is also of value in that all weed seeds and insect pests are destroyed. Growers should avoid poorly drained soils and thick sowing of seed.

A. B.

Disease in Plants, The Treatment of. By D. Houston (*Garden*, May 3, 1913, p. 215).—Hitherto prevention has been the only practical method, except in a few cases like incipient canker, the difficulty of destroying the mycelium of fungus within the plant being obvious. Miss S. M. Baker has recently tried a method of treatment entirely new to plant pathology, by which the internal parasite is destroyed by the use of a ferment that digests the fungus, while it is harmless to the plant. This is obtained from a toadstool known as *Coprinus caudatus*. The treatment was tried on a branch of a Victoria Plum, the last survivor of five main branches badly affected with silver-leaf disease. The method of treatment was by injecting a concentrated watery extract of the deliquescent cap of the *Coprinus*, applying externally a poultice of the same upon the parts of the dead wood showing fruit bodies of the parasite. After treatment for two years the upper branches showed no sign of silvering, and it had borne fruit in two successive seasons after sterility for three years, and produced remarkably vigorous new growth. The lower parts of the branch, however, near the infected dead wood, still showed slight silvering.

The subject is further discussed by Mr. R. Irwin Lynch, *Garden*, Nov. 29, 1913, p. 603.—H. R. D.

Early Flowers in Cornwall and the Scilly Islands, The Culture of. By W. Dallimore (*Bull. Roy. Bot. Gard. Kew*, 1913, No. 5, pp. 171-177).—The article describes the commercial cultivation of Narcissi. The method of marketing and the prices realized are also dealt with.—A. S.

Echium. By W. Vorwerk (*Gartenflora*, vol. lxiii. pt. iii. pp. 59-60; 1 fig.).—The following shrubby species of *Echium* are found in Madeira and the Canary Isles: *E. bifrons*, *E. simplex*, *E. fastuosum*, *E. giganteum*, *E. candicans*, *E. aculeatum*, and *E. strictum*. *E. bifrons*

is the most beautiful. It is raised from seed and thrives in pots containing a mixture of peat, cow dung, and loam. When the plants show signs of growth in February or March, place pieces of cow dung on the surface of the soil. The bushes remain for a long time covered with flowers. The cut flowers also last well. In summer, bring the shrubs into the open in full sun and water copiously.—S. E. W.

Elsholtzia Stauntoni. By S. Mottet (*Rev. Hort.* pp. 58–60, Feb. 1, 1914; 1 ill. and coloured plate).—With a necessary warning that this name should not be confounded with that of the altogether different plant *Eschscholzia*, a description is given of this vigorous and free-flowering shrub, which is shown by the coloured plate to be handsome enough for wide distribution, bearing long spikes of rich mauve flowers of the labiate description. It is a native of China, and flowers in the late autumn, when flowers are becoming scarce. Whether it is perfectly hardy seems as yet open to question, but it would probably thrive in our warmer gardens in Cornwall and elsewhere. The flowers are sweetly scented, and the foliage has a marked musk-like odour.
C. T. D.

Ephedra, Vegetative Reproduction of. By W. G. Land (*Bot. Gaz.* June 1913, pp. 439–445; 5 figs.).—*Ephedra (nevadensis?)* is found occasionally on the very steep rocky sides of Rifle Creek Canon (White River forest reserve) in Western Colorado. Occasional clumps of four to twenty plants were found between 2000 and 2200 mètres, especially on sand-tone slopes.

The largest plants are 7 feet 6 inches high, and may be 10 cm. in diameter. No seeds or seedlings were discovered; the author found that branches bent down by fallen stones take root and give rise to new clusters of plants. In one case underground connexions were traced for 15 mètres.—G. F. S. E.

Euphorbia jacquiniæflora. By Henri Chevalier (*Rev. de l'Hort. Belg.* Feb. 15, 1913, p. 41; plate).—A description of this plant, also called *E. fulgens*. A pretty greenhouse climbing plant from Mexico. Cultural directions are given.—M. L. H.

Evaporation and its Effect on Vegetation. By George Elwood Nichols (*Bot. Gaz.* Aug. 1913, pp. 143–152).—The author tested the intensity of summer-evaporation as a determining factor in the distribution of vegetation in Connecticut.

The observations were taken with the porous clay cup atmometers devised by Livingstone in sixteen stations, of which full particulars are here given. The base of the cup was 56 cm. from the ground, and a practically complete set of weekly readings was obtained at nearly every station.

During the first two months (June and July) the mean weekly rate of evaporation far exceeded that maintained during the latter

part of the season. This of course is the time of quick growth and development.

The weekly loss of water, as recorded by the porous cup atmometer, was in the Western Highland 137 c.cm. This area has a rainfall of 50 inches, and is chiefly granite, schists, and gneiss; the northern part was originally Sugarmaple-Beach-Hemlock forest. The Eastern Highland station gave 173 c.cm. This was formerly an oak forest, and the rainfall is 46.35 inches. The Central Lowland, which used to be Chestnut and Oak forest, evaporated 171 c.cm. (rainfall 47 inches), and the coastal region 135 c.cm. (rainfall 46 inches).—G. F. S. E.

Felicia. By W. Vorwerk (*Gartenflora*, vol. lxiii. pt. i. pp. 2-3; 1 col. plate).—Three varieties of *Felicia* are well worth cultivation in the cool house on account of their value as decorative plants; viz. *F. fruticosa* (syn. *Aster fruticosus*), *F. amelloides* (*Cineraria amelloides*), and *F. barbata* (syn. *Aster barbatus*). They are easily propagated from cuttings struck in February or March, and grown in a mixture of sand, peat and turf in gentle heat. In April, move into small pots containing peat, leaf-mould, loam, and sand, and transplant later into larger pots containing horn clippings added to the preceding compost.—S. E. W.

Fern, An Ornamental Algerian. By Dr. L. Trabut (*Rev. Hort. de l'Alg.* May 1913, p. 165; figs.).—Dr. Trabut describes the densely wooded swamp near Lake el Hont in Algeria, where a large colony of *Dryopteris propinqua* var. *callensis* (*Nephrodium callense* Trab.) has made its home. This fern had been collected before, but only in summer, and therefore never with fertile fronds until Dr. Trabut found it at Lake el Hont in the autumn of 1903.

The fern is here described and recommended for Mediterranean gardens and for temperate houses.—M. L. H.

Ferns, Chinese. By Carl Christensen (*Bot. Gaz.* Oct. 1913, pp. 331-338).—This is a complete list of the Ferns collected by Mr. William Purdom in 1910 in Shensi.

There are two new species of *Athyrium*, one of *Cheilanthes*, two of *Dryopteris*, one of *Mallencia*, and a *Polystichum*, all of which are here briefly described.—G. F. S. E.

Fig Coffee. By Antonin Rolet (*Rev. Hort. de l'Alg.* Sept. 1913 p. 349).—An excellent substitute for chicory in coffee is produced from dried, roasted, and powdered figs. A drink very suitable for children may even be made of this powder without any admixture of coffee berries proper. The various processes in its preparation are described, and it is pointed out that inferior figs not otherwise suitable for market might thus be made of use, and that the substitution of fig coffee from Algeria and Southern France for chicory, which is principally imported into France from Belgium and Germany, would be a great gain to the revenues of the country.—M. L. H.

Fig Tree, The. By A. de Mazières (*Rev. Hort. de l'Alg.* July 1913, p. 253; plates).—Describes the cultivation of the Fig in Algeria. The preparation of the soil, watering, manuring, propagation, capricification, pruning, and harvesting are all treated of, and there is a section on the parasites and diseases of the Fig.—*M. L. H.*

Flowers in 1913, Importation of (*Jour. Bd. Agr.* vol. xx. No. 10, p. 890).—The value of the fresh flowers imported into the United Kingdom in 1913 was £288,728, as compared with £220,863 in 1912.

A. S.

Fruit and Vegetables in 1913, Importation of (*Jour. Bd. Agr.* vol. xx. No. 10, p. 889).—The quantity of potatoes imported into the United Kingdom was considerably more than in 1912. The imports from all countries, except the Channel Islands, increased in 1913 compared with 1912. The chief countries in this trade are Germany, Holland, France, and the Channel Islands. The other vegetables imported were mainly onions and tomatoes.

With regard to the fresh fruit, there was a falling off in the imports of apples, apricots, peaches, cherries, grapes, lemons, and strawberries. There were increases in the imports of bananas, currants, gooseberries, nuts, oranges, pears, and plums.—*A. S.*

Fruit Culture in Normandy. By J. Porter (*Jour. Bd. Agr.* vol. xx. No. 10, pp. 860–865, fig.). A brief account is given of commercial pear culture in Normandy.—*A. S.*

Fruit-fly, Life-History of Mediterranean. By H. H. P. Severin (*Jour. Econ. Entom.* vi. p. 399; Aug. 1913; figs.).—The life-history in Hawaii was worked out on the tropical almond (*Terminalia Catappa*), and a list of thirty-eight fruits liable to attack is given. The following are said to be immune: *Artocarpus incisa*, *Citrus medica* var. *limonum*, *Morinda citrifolia*, *Morus nigra*, *Punica granatum*, *Tamarindus indica*.—*F. J. C.*

Fruit-fly, Mediterranean, Trapping the. By H. H. P. and H. C. Severin (*Jour. Econ. Entom.* vi. p. 347; Aug. 1913; figs.). This is an historical account of the use of kerosene in trapping the Mediterranean fruit-fly. The use of this material is regarded as absolute waste of time.—*F. J. C.*

Fruit-fly, Peruvian. By C. H. T. Townsend (*Jour. Econ. Entom.* vi. p. 345; Aug. 1913).—A new species of fruit-fly (*Anastrepha peruviana*), attacking a great variety of fruits on the Peruvian coast, is described. Peach, guava, and cherimoya are among the fruits likely to be infested. Lead arseniate, applied before the fruits begin to ripen, is said to be a good spray.—*F. J. C.*

Fruit-growing, Progress in, since Union. By P. J. du Toit, *Agriculture (Agr. Jour. Cape G. H.* vol. vi. No. 4, p. 601; Oct. 1913). **Fruit.**—Under this head the writer notes as follows:—

“We have a most favorable climate, suitable soil, and regular

rainfall for deciduous fruit in the south-western districts of the Cape. We produce the finest pears in the world. We have an expanding oversea market. There is a splendid field for dried fruit, an industry we have only begun to develop. We have in many parts of the Union large areas most suitable for citrus fruit and pineapples, in which two classes our export trade will chiefly develop.

"Our exports since Union were :—

	1910	1911	1912
Packages	200,000 (approx.)	234,208	296,963

"Concurrently with the development of the export trade, great progress has been made in the last few years in the planting of the best varieties, and in grading and packing for the home market and for export."—A. A. K.

Fruit Trees, Insect Pests which Attack. By A. E. de Mazières (*Rev. Hort. de l'Alg.* Aug. 1913, p. 286; and Sept., p. 317; figs.).—Two articles on the various insect pests which attack fruit trees, giving an illustrated description of each and the best method of destroying it.—M. L. H.

Fruit Trees, Wound Fungi in. By F. W. Hammond (*Garden*, April 19, 1914, p. 196).—The possibility of feeding the trees so as to render the sap in leaf and wood toxic to the fungi is suggested. Experiments with superphosphate sown in late summer or autumn at 5 cwt. to the acre are stated to have been successful, and sulphate of iron to have given varying results, sometimes scant success, sometimes it seems to have accomplished great improvement in the trees affected.—H. R. D.

Fungi, Edible. By A. G. (*Rev. de l'Hort. Belg.* Jan. 31, 1913, p. 25; plates).—An illustrated and descriptive list of all the edible fungi. Not all the species described are recommended, and fatal mistakes may so easily be made with some that the amateur had best leave them alone altogether.—M. L. H.

Garlic Culture in Southern France. By Guillaume Clément (*Rev. Hort. de l'Alg.* Sept. 1913, p. 342).—The results are here given by a practical cultivator of his experiences in garlic-growing in the Canton of Gardanne. This vegetable is in great demand in Southern Europe, and the crop, for the management of which hints are given, is said to be a profitable one, and to have the advantage of not exhausting the soil.—M. L. H.

Gasoline Torch Treatment of Date Palm Scales. By R. H. Forbes (*Jour. Econ. Entom.* vi. p. 415; Oct. 1913).—The use of the gasoline blast-lamp for destroying the scale insects *Parlatoria Blanchardi* and *Phoenicococcus Marlati* (the latter feeding hidden under the overlapping bases of the leaf-stalks) is recommended for the older plants. Young plants will not withstand the treatment.—F. J. C.

Gentiana verna. By R. A. Malby (*Garden*, Nov. 1, 1913, p. 548).—It occurred to the author that the difficulty of growing this plant could be largely modified by inducing the plants to go to rest at the end of the autumn, and a sheet of glass somewhat larger than the tuft was supported over it by wires to keep off the rain. This proved successful, and, to check the value of the practice, in 1912 two patches were planted in a compost of loam, leaf-mould, chips, sand and old mortar in about equal proportions in as nearly similar positions as possible. In November one was protected by a sheet of glass, the other being left alone. In March the glass was removed, and at that time the unprotected plant appeared not appreciably harmed by the wet winter. It ultimately developed eighteen flowers. The protected plant developed rapidly when the glass was removed and produced 206 flowers. The plants were about the same size when planted, but by the summer of 1913 the protected plant had doubled the unprotected in size.

The good effect of this method of treatment is confirmed by H. Turner, *Garden*, Dec. 6, 1913, p. 606.—*H. R. D.*

Geranium Robertianum, Pollination of. By Rob. Stäger (*Beih. Bot. Cent.* xxx. Abt. 1, Heft 1, pp. 1-16).—The flower of Herb Robert varies between a fair weather and a bad weather type with transitional conditions. Hence observations which appear to be flatly contradictory are in reality both correct. In fair weather the anthers shed their pollen rapidly, and may finish doing so before the stigmas are ripe. Flowering requires half a day. In rainy or unfavourable weather the stigmas develop more rapidly than the anthers; they may require one and a half to three days to do so. This last type occurs in wet, cold places, even in fine weather. Colour, size, and opening or shutting of the flower are much affected by light. But the chief factors are temperature and relative humidity of the air. Relatively high temperature with little air moisture hastens the opening of the anthers, but low temperature and much moisture delays their dehiscence and favours the growth of the stigma.

The author describes a whole series of experiments by which he unravelled this complicated system of regulation, by which sometimes protandry and sometimes protogyny prevails. Both are sometimes followed by autogamy. The author also studied a white variety which is dichogamous.—*G. F. S. E.*

Geranium Rosat, The. By Jean Dubled (*Rev. Hort. de l'Alg.* May 1913, p. 203).—A review of a recent work on the cultivation of this geranium for distilling purposes. This industry is said to be profitable, the small distillery necessary is cheaply installed, and with a well-made plantation a crop may be taken the first year. There are cheaper chemical substitutes for the perfume on the market, but these are said to be so obviously inferior to the vegetable essence as to do it no harm commercially.—*M. L. H.*

Gomphrena, New Forms of. By Jar. Stuchlik (*Beih. Bot. Cent.* xxx. Abt. 2, Heft 3, pp. 392-411; 1 pl.).—The author describes a number of new varieties in this genus and gives the distribution of certain species with critical notes.—G. F. S. E.

Gooseberry Mildew, American. By E. S. Salmon (*Jour. Bd. Agr.* vol. xx. No. 12, pp. 1057-1079; 2 plates).—The first part of the article describes a number of spraying experiments carried out during 1913 at three centres in Kent. The experiments had two main objects: (1) to ascertain at what strength and to what extent lime-sulphur can be used without causing injury; and (2) to compare the fungicidal action against the mildew of lime-sulphur and liver-of-sulphur.

Experiment showed that it is unsafe to use sulphur in any form on the variety 'Yellow Rough' ('Golden Drop'), since severe defoliation results when either lime-sulphur, liver-of-sulphur, "flowers of sulphur," or iron sulphide is used. The high degree of susceptibility to injury possessed by this variety was clearly illustrated in an experiment in which the soil surrounding some bushes was sprayed with lime-sulphur wash, care being taken that none of the spray touched the bushes. After a few days considerable leaf-fall occurred, owing apparently to the gas (either sulphuretted hydrogen or sulphur dioxide) given off by the lime-sulphur wash when exposed to the air.

It would appear that 'Freedom' may safely be sprayed with lime-sulphur at "full strength" (i.e. 1·01 sp. gr.) once or twice in May or earlier, but more frequent applications or spraying later in the season will cause a certain amount of leaf-fall.

'Howard's Lancer' was sprayed with "full strength" lime-sulphur on three successive occasions during May and June and no injury resulted, whilst 'Gunner's Seedling' withstood four, and 'May Duke' five such sprayings. 'Berry's Early' was not injured by six successive sprayings given during May, June, and July.

'Cousin's Seedling,' which appears to be specially liable to severe attacks of the mildew, both on the shoots and the berries, suffered no appreciable injury from "full strength" lime-sulphur though it was used on as many as five successive occasions from May to July. Liver-of-sulphur was also used on a number of bushes of this variety, but it was found under the relative conditions to be quite ineffectual in stopping the spread of the mildew even when used at the rate of 2 oz. to 3 gallons of water. Not only is lime-sulphur the more powerful fungicide, but it has also the great practical advantage over liver-of-sulphur that it is, when once dry on the bush, so remarkably adherent that even heavy rains do not wash it off. In this connexion it is pointed out that if the fruit is covered by a deposit at the time of gathering it is practicable to cleanse the berries before marketing by rinsing them in water. With the more troublesome varieties, such as 'Lancashire Lad,' the end is most easily attained by the use of a form of the Fletcher and Becker Gooseberry Cleaner, which not only cleanses the berries, but grades them also.

With regard to the use of "flowers-of-sulphur," attention is drawn to the fact that a mixture of slaked lime and sulphur, such as is often recommended, has been shown to possess a lower fungicidal value than sulphur alone. Moreover, this was to be expected in view of the theory of the action of sulphur.

During 1913 it was observed that as early as August large numbers of perithecia were becoming detached from the mycelium and were dropping on to the soil. It was also noticed that the winter-stage was formed on a very large number of leaves. In view of these facts it is desirable that "tipping" should be done in August in order to prevent infection of the soil.

Several cases are cited in which the winter-stage occurred very early in the season, the summer- and winter-stages appearing almost simultaneously. Such being the case, some amount of "tipping" to remove the winter-stage will always be absolutely necessary, since it is commercially impossible to keep all the shoots continuously sprayed throughout the growing period, and no known spray will kill the winter-stage. Early "tipping" must be regarded as a measure of primary importance and spraying at certain times only as a valuable adjunct.—A. S.

Graft Hybrid, a new *Pyrocydonia Winckleri*. By D. Bois (*Rev. Hort.*, pp. 27-29; Jan. 16, 1914; three woodcuts).—A very interesting account of a mixed hybrid somewhat on the lines of *Cytisus Adami*, resulting from grafting a pear upon a quince, the result being the formation below the graft of two opposite branches, one bearing quince growths and the other those of a form which has been named *Pyrocydonia Winckleri*, differing markedly from both pear and quince. It is therefore a new plant and can be propagated truly, which is not so with other similar cases. The woodcuts show the different foliage and habits of growth.—C. T. D.

Grapes, Preservation of, by Chinese Method. By J. Ph. Wagner (*Rev. Hort.*, pp. 565-6, Dec. 1, 1913; 1 ill.).—A description of a very interesting method, sound bunches being cut when ripe and their stalks inserted upright, as deeply as they admit of, into sound sugar-beetroot tubers, several in each, according to size. The tubers are ranged apart in a chamber, which is made of wire netting covered with paper and dry soil of sufficient depth to entirely exclude light and air. With this treatment not only are the grapes preserved until the following March or later, but they acquire an exceptional sweetness, due, it is assumed, to assimilation of sugar from the beet. The experiment would appear to be well worth trying here under similar conditions.

C. T. D.

Greenhouse, A Floating (*Rev. de l'Hort. Belg.* July 15, 1913, p. 289).—A curious note on a late experiment carried out on one of the steamers of the Hamburg-America line, sailing from Hamburg to Argentina. A greenhouse was installed on board, heated at first

and artificially cooled as they approached the tropics, by which means a constant supply of flowers was produced during the two months' voyage. One result of the experiment was the surprise and pleasure shown by the native inhabitants of Buenos Ayres, who were enabled to enjoy their first sight of lilies of the valley and lilacs.—*M. L. H.*

Hooklike Organs, Structure of. By Reinhard Wegener (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 1, pp. 43-89; 26 figs.).—The author describes the anatomical structure and function of the hairs of *Asperula*, *Rubia*, Hop, *Galium*, *Parietaria*, and *Panicum verticillatum*, also of the trichomes of *Thladiantha*, *Apios*, *Desmodium*, and *Aristolochia*, and of the emergences and phyllomes of *Arctium*, *Xanthium*, *Agrimonia*, Sanicle, *Geum* stigmas, *Medicago* spp., *Acaena*, *Bidens*, and *Echinosperrum*.

The paper should be of great interest to biologists, and the figures bring out clearly a number of minute points in shape, &c., which are clearly adaptive. Amongst others may be mentioned the very general cutinization of the cell-wall of trichome hooks, the socket-like base of the hooked hairs of *Rubia*, the peculiar way in which the upper branch of the Hop trichome acts as a buttress and yet does not interfere with upward growth, the extraordinary development of cutinized supports at the base of hairs of *Apios tuberosa*, and the separation layer and minor adaptations in *Geum* styles.

The longitudinal sections of the spine of *Acaena ovalifolia* and *Echinosperrum Lappula* are particularly beautiful examples of mechanical engineering in plant tissues.—*G. F. S. E.*

Hydrocharidaceae, Leaf-Anatomy of. By H. Solereder, Erlangen (*Beih. Bot. Cent.* xxx. Abt. 1, Heft 1, pp. 24-104; 53 figs.).—There are three marked types of leaf in this order. (a) One-nerved, sessile, and submerged, as in *Elodea*; (b) long, grasslike, with longitudinal and transverse nerves, as in *Vallisneria*; (c) the type of *Hydrocharis* with blade, leaf-stalk, and several nerves. Palisade tissue and stomata are only found in the air leaves, as e.g. of *Stratiotes*. Secretory cells are common and are only wanting in four genera.

There are no special anatomical characteristics of this family considered as a whole. Raphid-bundles do not occur, though raphides are found.

The genera described are the following: *Halophila*, *Hydrilla*, *Elodea*, *Lagarosiphon*, *Vallisneria*, *Blyxa*, *Enalus*, *Thalassia*, *Stratiotes*, *Ottelia*, *Boottia*, *Hydrocharis*, *Limnobium*, and *Hydromystria*.

G. F. S. E.

Hypericum calycinum (grandiflorum) (*Rev. Hort.*, pp. 314-15, Nov. 16, 1913).—Highly recommended for the formation of protective belts of vegetation between forest areas, as, owing to its dense and low growth and non-inflammable character, it is admirably adapted to prevent the spread of fires. It is quite hardy, immune from destruction by game, grows vigorously under dry conditions and either in sun or shade, but is rather too assertive for garden culture.—*C. T. D.*

Inheritance of Waxy Endosperm in Hybrids with Sweet Corn.

By G. N. Collins and J. H. Kempton (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ. 120*; April 1913; pp. 21-27).—The waxy endosperm characteristic of the variety introduced from China in 1908 has never been observed in any American variety. When crossed with varieties that have a horny endosperm the waxy endosperm is completely recessive, the immediate result of the cross being seeds that are indistinguishable from those of horny varieties. In a general way waxy endosperm behaves like sweet endosperm, which is also found to be recessive to horny in the first generation, and to segregate as a monohybrid in the following generation. This paper gives the results of six crosses between varieties having sweet and waxy endosperms. In each instance the resulting ears were all horny, the endosperm in every way resembling the horny endosperms of ordinary varieties. Four of the six ears obtained as a result of the crosses in 1911 were selected for planting in 1912, and they produced fifty-five ears containing 22,132 seeds, of which 57·4 per cent. were horny, 24·8 per cent. sweet, and 17·8 per cent. waxy, these proportions approximating the 9:4:3 Mendelian ratio involving two factors. Careful scrutiny of the sweet seeds failed to show any consistent differences that would allow of the separation of the new type of sweet corn indicated by this ratio. Experiments have been outlined for isolating and determining the nature of this new type.—*A. P.*

Insecticide, Hot Water as an. By R. P. Brotherston (*Garden*, March 1, 1913, p. 116).—Water heated to 180° is recommended as an application to cure red spider on vines; it does not spoil fruit or foliage; also for washing bug-infested vines, and, with a little quassia, peaches.

In sponging plants with an insecticide a larger basin of water should be at hand in which to rinse the sponge, so as to prevent fouling the insecticide.—*H. R. D.*

Iron, Sulphate of, for Chlorosis (*Jour. Soc. Nat. Hort. Fr.* July 1913, p. 484).—When sulphate of iron is used as a remedy for chlorosis in fruit trees, the usual practice is to make a small cavity at the base of the trunk and to introduce as much powdered sulphate as it will hold. This proceeding, of which the efficacy is not to be denied in principle, has one drawback. It does not restore the colour to all the branches when a whole tree has to be treated; indeed, the effect is often restricted to the branches in the immediate neighbourhood of the cavity. M. Rivière and M. Bailhache, having noticed this partial failure in the course of their experiments, attributed it to the precipitation of the protosulphate of iron by the tannin contained in the tissues of the tree, and they therefore determined to substitute another salt of iron which was not liable to such precipitation. They have accordingly carried out some experiments with a solution of citro-ammoniacal pyrophosphate of iron. They started with a mixture containing 50 centigrammes

of iron to 1 litre of water, but this proved to be too strong. The leaves of the tree turned black and fell off; the new leaves which replaced them after some weeks were, however, quite green. The dose was reduced to 50 milligrammes per litre of water, and the experiment was tried on pyramid trees instead of on branches of cordon-trained ones. The result was completely satisfactory, the leaves were not detached from the tree, they regained their normal colour a few weeks after having absorbed the pyrophosphate of iron, and though there has not been time yet to register exactly how long the effect remains, it is already apparent that the action of the iron remains in force for several years.—*M. L. H.*

Irritating the Skin, Plants (*Agr. Gaz. N.S.W.* vol. xxiv. pt. x. p. 916).—*Humca elegans* must be added to the list of plants which may cause skin irritation.—*S. E. W.*

Kniphofia gracilis (*Rev. de l'Hort. Belg.* July 15, 1913, p. 227; plate).—Messrs. Krelage & Sons, of Haarlem, have produced a new race of hybrid Tritomas (*Kniphofia gracilis*) which should be a great acquisition. The spikes of bloom are smaller and more graceful than those of the old *Kniphofia aloides*, the colours vary from pale yellow to a flaming orange-red, and the variety has the advantage of producing an uninterrupted profusion of flowers during the whole summer and until the frost. The most meritorious of the section are said to be: 'Golden Spire,' 'Jaune Suprême,' 'La Citronnière,' 'Orange Queen,' 'Prince of Orange,' 'Solferino,' 'Sovereign.'—*M. L. H.*

Lemon, The, To Preserve and Prepare for Sale (*Rev. Hort. de l'Alg.* July 1913, p. 280).—A note on gathering, maturing, and packing lemons for market. Care and attention are well bestowed on these processes, as the lemon is a fruit which is capable of great improvement after it has been gathered.—*M. L. H.*

Light and Shade on Beech Twigs, Effect of. By Hermann Farentholtz (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 1, pp. 90–118).—There is a great difference in anatomical characters between the long and the short Beech twigs, which must be compared separately. On sun shoots the epidermis has smaller, thicker-walled cells; the periderm is formed sooner and is more abundant (seven to ten layers on upper side as compared with four to five layers on upper side of shade twigs); the tangential walls are stronger; stone cells are more numerous (170 on upper, thirty on lower, as compared with only four in the whole of a shade twig). The primary bast fibres are more strongly thickened in sun shoots. The wood is also much more developed. A sun shoot two to three years old is equal in thickness to a shade shoot ten to twenty years old.

The short shoots differ in many characters from the long ones, and some of these appear to be due to differences in the exposure to light.

The differences in seedling Beeches exposed to light and shade

are partly due to the more abundant nutrition of the former, partly to the direct influence of light (especially in the periderm). In some respects the seedling axis is like the shade form of twig.

Beech buds developed in sun are larger and have more bud scales than those in the shade.

The author also discusses the asymmetry of Beech leaves, showing that this is influenced by amount of light. The first leaves of a shoot (not the one at the tip) are the most unsymmetrical.

G. F. S. E.

Lilacs, Leaf Curl. By R. Laubert (*Gartenflora*, vol. lxiii. pt. i. pp. 9-11; 1 fig.).—Pot-grown lilacs have been attacked with disastrous results by a disease which causes the edges of the leaves to fade and curl over and the leaves to fall in July. This disease is not due to fungi. The diseased leaves are twice as heavy as the healthy leaves and are filled with starch granules. The accumulation of starch is probably due to errors in cultivation, *e.g.* over-manuring, insufficient watering, or to a check to the development of the roots by using too small pots.

The leaves of Peaches suffering from leaf curl and gumming are also abnormally rich in starch.—S. E. W.

Lilies. By E. A. Bowles (*Garden*, Jan. 4, 1913, p. 11; Jan. 11, p. 23; Jan. 18, p. 34; Jan. 25, p. 46; Feb. 8, p. 70).—Gives an account of the common garden lilies and their cultivation.—H. R. D.

Lime-sulphur. By C. P. Scrivener (*Ag. Gaz. N.S.W.* vol. xxiv. pt. ii. p. 988).—Spraying with lime-sulphur under high pressure is said to be superseding the use of Bordeaux mixture.—S. E. W.

Manures, Chemical, Some New (*Rev. Hort. de l'Alg.* Sept. 1913, p. 353).—A note on some experiments carried out by different firms in Germany with the view of producing some new forms of chemical manures, and of utilizing substances not hitherto employed in agriculture at prices which would be remunerative to the farmer.—M. L. H.

Manures in 1913, Importation of (*Jour. Bd. Agr.* vol. xx. No. 10, pp. 890 and 926):

Manure.	Quantity.		Value.	
	1912.	1913.	1912.	1913.
	Tons.	Tons.	£	£
Basic Slag	49,313	51,133	89,174	102,114
Bones, burnt and unburnt	41,203	40,685	217,544	219,637
Guano	14,115	25,548	81,568	149,189
Nitrate of Soda	123,580	140,926	1,274,752	1,490,669
Phosphate of Lime and Rock Phosphate . . .	520,267	539,016	840,996	874,166

A proportion of the nitrate of soda imported is used in the manufacture of sulphuric and nitric acids.—A. S.

Manures, Sale in Small Quantities at Excessive Prices (*Jour. Bd. Agr.* vol. xx. No. 11, pp. 978-980).—Purchasers of small quantities of artificial manures pay comparatively high prices. For example, the following prices (carriage paid) for kainit appear on a current price list :—1s. 6d. for 7 lb., a price equivalent to £24 per ton ; 2s. 6d. for 28 lb. = £10 per ton ; 6s. for 1 cwt. = £6 per ton. Four or five tons of kainit could probably be obtained in most districts at the rate of about £2 15s. per ton.

The manipulation of small quantities by sellers involves extra packing, a higher proportional cost of carriage, additional warehousing, and other items incidental to retail trade, and this adds greatly to the cost as compared with that of large consignments obtained direct from the manufacturer. The adoption of co-operative methods appears to be the only way by which those who need small quantities can avoid the payment of relatively high prices.

The extra cost to the small buyer is often even greater in the case of mixed manures than in the foregoing instance. Thus, a shilling packet of a much-advertised manure contained about as much fertilizer as would cost a farmer using artificial manures in quantity one halfpenny.

The fallacy of the supposition that an analysis constitutes a guarantee that the manure is worth the price asked for it is pointed out, and intending purchasers are advised to calculate by means of the unit system the value of manures offered for sale.

Apart from the greater cost, the purchase of compound manures is as a general rule to be deprecated, as the best results can only be obtained by studying the requirements of each kind of plant and manuring accordingly. In a garden it is, however, useful to have a mixture which can be used for most quick-growing plants, and may be relied upon to give satisfactory—even if not the very best—results. Such a mixture might be cheaply prepared as follows :—

1 part (by weight)	Sulphate of Ammonia (" 95 per cent. pure ").
6 parts	„ Superphosphate (" 26 per cent. Soluble Phosphate ").
1½ part	„ Bone Meal (finely ground).
1½ „	„ Sulphate of Potash (" 90 per cent. pure ").

The mixing should be done carefully, and the whole should be passed through a sieve of about $\frac{3}{8}$ inch mesh. If stored in a dry place the mixture will keep for years without any appreciable change. The rate of application should not exceed that of 1 lb. to four square yards unless the use of manures is well understood.—A. S.

Mazus rugosus. By the Wargrave Plant Farm, Ltd. (*Garden*, March 29, 1914, p. 154 ; fig.).—The following particulars are given of this plant, which received an Award of Merit at the Royal Horticultural Society's meeting on March 4. The plant originally came from the Himalayas, and spreads by means of procumbent stems which root as they grow. These produce flowers 1 inch in height, the plant exhibited thus giving the impression of a pan of seedlings. When

established it covers itself with flowers during the spring months and produces a few solitary flowers during summer. They are of a deep mauve colour, freely spotted with orange on a white ground. The plant is perennial. Johnson's *Gardener's Dictionary*, in describing both *Mazus rugosus* and *M. Pumilio* as hardy annuals, is erroneous. *M. Pumilio* is quite distinct, producing slender underground rhizomes and spatulate leaves 1 inch long. It flowers only in summer.

By R. W. (*Garden*, April 12, p. 178).—There is a doubt as to the correctness of the name. Sweet figures *M. rugosus* in vol. i. of *British Flower Garden* as an annual, and Sir Joseph Hooker describes it in vol. iv. of his *Flora of British India* as a glabrous or sparsely hairy annual without runners. This is a different and less valuable plant than that of the Wargrave Plant Farm. Is it one of the new Chinese species? Except in colour of flowers it agrees with the description of *M. pulchellus* collected by Dr. Henry at Ichang.

H. R. D.

Meadow. By J. A. Bonsteel (*U.S.A. Dep. Agr., Bureau of Soils, Circ. 68*; July 1912).—The term "Meadow" in the language of the United States Bureau of Soils signifies one particular stage of alluvial land which has not yet been built up beyond the reach of periodical submersion and of the addition of surface deposits through the medium of running water. It occurs under the tide-water at the mouths of rivers, and at intervals along both or alternate banks of rivers which are fed by mountain streams, and these successive deposits may therefore consist of varying material brought from widely different formations, and the added layer is in some instances deep and heavy enough to obliterate all traces of existing cultivation. Meadow may consist of valuable pasture (it was the discovery of this fact by early pioneers which originally determined the choice of its name), of wild grasses, of arable land, and of the many thousand acres of such land which exist in the United States many thousands are as yet waste or are covered with dense forest. It is from its nature undrained, and is difficult to classify, as its character may suddenly be entirely changed by the addition of some new deposit; but it includes some of the best pasture land in the States, and much more of it might well be made to pay for the cost of clearing, draining, and protection from overflow and from the encroachment of tide-water.—M. L. H.

Mentha. By Anton Topitz (*Beih. Bot. Cent. xxx. Abt. 2, Heft 2, pp. 138-264*; 144 figs.).—This paper is a full and complete description of the European Mints. There is a short preliminary account of the morphology of *Mentha*, and then follows the detailed description with figures of the leaves of all the varieties and forms. The number of names of species and varieties of Mints treated of in this paper amounts to about six hundred. Of these, we think 213 are new names of varieties, &c., proposed by the author. There is a good index and bibliography.

The following is the author's view regarding hybrids :

M. villosa Huds. = *rotundifolia* × (*longifolia* × *viridis*).

M. Maximiliana F. Sch. = *aquatica* × *rotundifolia*.

M. dumetorum Schult. = *aquatica* × *longifolia*.

M. piperita Huds. = *viridis* × *aquatica*.

M. verticillata L. = *arvensis* × *aquatica*.

M. gentilis L. = *arvensis* × *viridis*.

M. rubra Smith = *verticillata* × *viridis*.

M. dalmatica Tausch. = *arvensis* × *longiflora*.

M. carinthiaca Host. = *arvensis* × *rotundifolia*.

The descriptions of forms and varieties are arranged in a key, and may be clear enough if the reader can manage to remember the abbreviations used by the author.—G. F. S. E.

Michaelmas Daisies. By S. T. Grignan, *Rev. Hort.*, p. 108, March 1, 1914; coloured plate).—The plate represents a group of pretty varieties, of which 'Lutetia Rose' is by far the best, having very large rose-lilac flowers, which it bears abundantly on plants scarcely 2 feet high and compact. It is a cross between *Aster microcephalus* and *A. novi-belgii*, and clearly a worthy acquisition as regards both habit and floriferousness.—C. T. D.

Millipedes and Centipedes (*Jour. Bd. Agr.*, vol. xxi., No. 1, pp. 46-49; fig.).—The article deals mainly with the life-history and habits of millipedes and discusses the various methods of combating the pests.—A. S.

Mutation, A Purple-leaved, in Hemp. By L. H. Dewey (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 113; Feb. 1913; pp. 23 and 24).—A singular mutation, showing strongly-marked colour variation in foliage and seed, arising from a closely-inbred strain of a uniform group of plants.—A. P.

Narcissus Bulbs, A Disease of. By G. Massée (*Jour. Bd. Agr.* vol. xx. No. 12, pp. 1091-1093; plate).—During 1913 the disease of Narcissus bulbs caused by the parasitic fungus *Fusarium bulbigenum*, Cooke and Mass., increased to such a serious extent that in some cases entire plots of bulbs were completely destroyed. As a rule the presence of the parasite is first indicated by the appearance of small yellowish spots on the leaves. These gradually increase in size, becoming brown and dry, and the trouble spreads to the bulb by the extension of the mycelium, and probably also by a series of independent infections from spores washed down from diseased patches higher up the leaves. At first the tips of the scales only are injured, as indicated by a brown colour; but the injury gradually extends to the base, and soon the entire bulb is of a uniform brown colour. At this stage numerous chlamydospores or resting-spores are produced on the mycelium present in the substance of the scales, and these, being liberated into the soil when the bulb decays, serve to infect future crops. Moreover,

fallen diseased leaves infect the soil, since they too contain large numbers of chlamydospores in their tissues. So far as is known at present, only Narcissi are attacked, but most probably in the course of time the fungus will extend its ravages to other bulbous plants. In the circumstances the safest course is to avoid planting bulbs for two or three years on land which has produced a diseased crop. No kind of dressing is likely to destroy the chlamydospores directly, but it is stated that when they are germinating in the spring the secondary spores which they produce would be killed by a dressing of kainit, or of sulphate of potash, lightly worked into the soil.—A. S.

Narcissus Fly (*Merodon equestris*). By G. Stocks (*Garden*, April 26, 1913, p. 203; Sept. 13, 1913, p. 458).—Some interesting observations of this fly are given. In 1909 about thirty larvæ were collected, and the first metamorphosed in March 1910. May was the most prolific month; none were seen after June 25. In 1911 the spring was cold, and no flies were seen till May 25; after this they came out daily; the last caught was on June 21. A number of females were dissected and the number of eggs found to average about sixty. The author gives some reasons for thinking the fly lives two years in the larval state. He considers the best method of destruction is to catch the fly with a net when settled on the ground. The chrysalis may also be sought for in the beds in March, April, May, and June.

The author in the second article gives his experience in 1913. After the new year the more mature larvæ begin to prepare for the chrysalis state; the grub works itself to the neck of the bulb and sometimes rises on to the soil, remaining there until its change is complete. Mating appeared to take place about June 12. An experiment is described in which some suspected bulbs were soaked in water, which seems to indicate this cannot be altogether relied upon to destroy the grubs.—H. R. D.

Nematodes or Eelworms. By G. Massee (*Bull. Roy. Bot. Gard. Kew*, 1913, No. 9, pp. 343-351; plate).—Six kinds of eelworms are known to be destructive to plants in Britain, and although the amount of acknowledged injury caused by their presence is very great, it is practically certain that many diseases usually attributed to other causes are primarily due to eelworms. Whilst fungi are undoubtedly the cause of an enormous loss to cultivators of plants, there is a good deal of evidence to show that they are not so much to blame as is usually supposed for being the primary cause of plant diseases. In many cases the fungus is only a secondary agent, but because the damage done by it is more obvious than that produced by the primary cause the pathologist often concludes that the injury is entirely due to the fungus, when in reality, had the road not been made clear by the primary agent, the fungus, which simply completed the work of destruction, could not have gained a foothold. Not the least important of such primary agents are eelworms.

The gall-forming eelworm, *Heterodera radicola* Mull., is the best known and does the greatest amount of damage in Britain, being particularly troublesome on the roots of Tomatos and Cucumbers. Among other plants attacked are Vines, Potatos (tubers), Phloxes, Roses, and Balsams. Its life-history is given, and preventive measures are discussed.

The Sugar-beet eelworm, *Heterodera Schachtii* Schm., differs from *H. radicola* in not forming galls or knots on the roots of the host-plant. It is a serious pest in the Sugar-beet fields in Germany, and in addition is known to attack about fifty other plants, including Potatos, Cabbages, Radishes, and Spinach.

A third eelworm, *Tylenchus devastatrix* Ritzema Bos, causes one form of Clover sickness and also "tulip root" or "segging" of Oats. It also attacks Strawberries, causing the leaves to become crinkled and deformed at an early stage and the plants to rot off at the ground level.

Aphelenchus fragariae Ritzema Bos, is the cause of a second disease of Strawberry plants, known as the "cauliflower" disease. Diseased plants present a fasciated appearance, the stems and leaves being consolidated into an irregular fleshy mass, suggesting a Cauliflower. The flowers also assume monstrous forms.

Tylenchus tritici Bastian, is the cause of "ear-cockles" of Wheat. The grain, which is the part attacked, becomes changed into a roundish, blackish-purple mass, somewhat smaller in size than a normal grain. When it is crushed, and examined under the microscope, it is seen to contain eelworms.

The Fern eelworm, *Aphelenchus olesistus* Ritzema Bos, forms brown streaks or patches on the living fronds of various kinds of Ferns. The shape of the brown patches is determined by the venation of the particular Fern attacked, since eelworms in the tissues of a Fern frond cannot penetrate beyond the portion circumscribed by a vein. In addition to Ferns, this eelworm attacks the leaves of many kinds of flowering plants, e.g. Chrysanthemum, Begonia, Calceolaria, Gloxinia, and Coleus, forming more or less extended brown patches, frequently mistaken for the injury done by thrips.—A. S.

New Plants from Guatemala and Costa Rica. By John Donnell Smith (*Bot. Gaz.* June 1913, pp. 431-438, and July 1913, pp. 51-62).—Descriptions of new species of *Rheedia*, *Caryocar*, *Maytenus*, *Meliosma*, *Philocarpus*, *Calyptrella*, *Gilibertia*, *Basanacantha*, *Perymenium*, *Arctostaphylos*, *Cordia*, *Abutilon* (2), *Comocladia*, *Dalea*, *Dioclea*, *Phaseolus*, *Platymiscium*, *Lonchocarpus*, *Derris*, *Diplotropis*, *Mimosa*, *Pithecolobium*, *Aralia*, *Manettia*, *Rondeletia*, *Ipomoea*, *Cacabus*, *Salvia*, *Gaiadendron*, and *Euphorbia*.—G. F. S. E.

New Plants from Idaho and Nevada. By A. Nelson and J. F. Macbride (*Bot. Gaz.* May 1913, pp. 372-383).—New species of *Calochortus*, *Clematis*, *Delphinium*, *Horkelia*, *Astragalus*, *Nemophila*,

Phacelia, *Oreocarya*, *Castilleja* (2 sp.), *Pentstemon*, and *Erigeron* are described in this paper.—G. F. S. E.

New Plants from the Rocky Mountains. By Aven Nelson (*Bot. Gaz.* July 1913, pp. 63-71).—Descriptions of new species of *Brodiaea*, *Eriogonum*, *Polygonum*, *Atriplex*, *Arceuthobium*, *Astragalus*, *Chylisma*, *Azaleastrum*, *Gentiana*, *Merlensia*, *Oreocarya*, *Pentstemon*, *Wyomingia*, and *Taraxacum*.—G. F. S. E.

Nitrate Decomposition in Soil Apart from Bacterial Action. By I. Vogel (*Centralbl. f. Bakt.*, Bd. 34, Abt. 2, p. 540).—The author makes the new and interesting observation that nitrates in the soil may undergo decomposition quite apart from the action of denitrifying bacteria. If sodium nitrate is distributed in thin layers of soil containing 15 to 20 per cent. water, active decomposition of the nitrate takes place, the nitrogen loss amounting to as much as 80 or 90 per cent. The decomposition of the nitrate occurred in various different soils, free nitric acid being formed; in the case of soils rich in humus, nitrous acid was also produced, along with oxides of nitrogen. The sodium combined with the calcium carbonate of the soil to form sodium carbonate, leading to material alteration in the physical as well as chemical characters of the soil. This non-bacterial decomposition of nitrate is probably related in some way to colloidal phenomena.
F. C.

Nitrates and Nitrites in Plant Tissues. By Richard Klein (*Beih. Bot. Cent.* xxx. Abt. 1, Heft 1, pp. 141-166; 2 pl.).—The author describes various reactions for nitrates, and considers "Nitron" (Merck's) is the best. Nitrates are especially common in herbaceous plants and also in *Tilia*. (There is a list of plants in which the author observed nitrates.) They are absorbed by the root hair zone in the root, and also in the part below the root hairs, but are not found in the root tips. Nitrates are especially common in the pith and cortical parenchyma, in the leaves generally near the vascular bundles, but are seldom found in the flowers. They occur chiefly in unripe fruits, probably showing that they are assimilated in the fruit to which the nitrogen is carried in inorganic form. They occur in the sap of seedlings, but apparently not in that from the regular nitrate plants. For nitrites the author used Griess' reaction. They do not occur in the sap drawn from cut stems of *Fuchsia*, but are formed in it by bacteria and fungi. Nitrites were found in the sap of etiolated Potato shoots when these developed without access to salts in solution, also in tubers before germination, in the sap of *Erythrina* leaves, and in the root tubercles of Leguminosae, but they do not occur in *Sagittaria* or *Pisum*. The reaction in the last two cases is due to anthocyan.—G. F. S. E.

Nitrification in Different Soils. By H. Fischer (*Landwirtsch. Jahrb.*, Bd. 41, p. 755).—The author found that nitrification takes place more rapidly in a somewhat heavy soil than in a light sand.

One of the causes is evidently the lack of lime in the latter. On the other hand, the formation of ammonia is greater in light than in heavy soils. The theoretical quantity of lime calculated as necessary for the nitrification of a given amount of ammonia does not in reality, according to the author's results, suffice for complete nitrification, this process attaining its maximum rapidity with about three times the theoretical amount of lime. Nitrification is favoured by the supply of organic substances, such as sugar or peat decoction, but when too much nitrogenous material is supplied denitrification takes place, especially in light soils. The author's experiments on the bacterial content of three originally similar soils treated differently for three years (unmanured, ammonium sulphate added, sodium nitrate added) lead him to the conclusion that the bacterial differences between such differently treated soils are relatively slight, and that a much more natural expression of the bacterial character of a soil is given by actual soil experiments than by water cultures.—*F. C.*

Nitrogen and Soil Fungi. By H. N. Coddard (*Bol. Gaz.* Oct. 1913, pp. 249-305; 18 figs).—The author has again investigated the disputed question as to whether fungi can assimilate free nitrogen. He finds many fungi which habitually live in the soil, and which he suspects to be uniform in all soils and to be but little changed by tillage and manure.

None of the fourteen species isolated by him were able to assimilate free nitrogen.

A mycelium growth is possible in practically nitrogen-free media, but it is in a starved and shrivelled condition.

Myceliophthora when grown in nitrogenous solutions of different concentration assimilates different proportions of the nitrogen-compound.—*G. F. S. E.*

Novelties, Protection of. By Ant. Kroone (*Rev. Hort.*, pp. 10-11, Jan. 1, 1914).—An interesting article on this subject, pointing out the impracticability of establishing, as it were, a copyright, as can be done in literature and art, by signature or otherwise, as it is impossible to guarantee that a like novelty has not arisen in other hands. He, however, gives the address of l'Union horticole professionnelle internationale, whose secretary is M. Van Lennep, 15 Molenstraat, La Haye (Netherlands), which has assumed the registration of novelties and gives any desired information.—*C. T. D.*

Nymphaeas. By H. Memmler (*Gartenflora*, vol. lxiii. pt. iv. pp. 84-91).—Water lilies require full exposure to the sun, and care must be taken to replace the water lost by evaporation. The roots of even the hardy sorts must be protected from winter frosts. The species can be increased from seed, but the hybrids are unfertile. The genus is divided into two groups and five subdivisions. I. N. apocarpiae: (a) *Anecphyra*, (b) *Brachyceras*. II. N. syncarpiae: (a) *Castalia*, (b) *Lotus*, (c) *Hydrocallis*.

Anecphyia. *N. gigantea* is a tender variety with blue scentless flowers. The varieties *violacea* and *Harrisoniana* have smaller flowers, coloured violet and lilac-blue respectively. They are natives of Australia.

Brachyceras. *N. elegans* is a native of Texas, Mexico, and Rio Grande. This beautiful plant opens its pale violet flowers in the morning. *N. ampla*, from tropical and subtropical America, has white starry flowers; so also have the varieties *speciosa* and *pulchella*. *N. flavo-virens*, with white sweet-scented flowers, crossed with *N. zanzibariensis*, yields valuable hybrids.

N. stellata and its varieties are natives of Java and Borneo, and the flowers open at night. The type is pale blue, *cyanea* blue and *versicolor* dark pink. *N. coerulea* is the blue lotus of Egypt. The white variety is very rare. *N. Hendelotii* and *N. ovalifolia* have blue flowers. *N. calliantha*, from South-West Africa, is violet-purple, and the variety *tenuis* white. *N. capensis*, from Madagascar, opens its pale blue flowers at night. The variety *madagascariensis* bears small blue flowers, and *zanzibariensis* dark blue, richly perfumed, opening at night. There are pale blue and pink varieties. *N. sulfurea*, from West Africa, and *N. Stuhlmannii* have aromatic yellow blossoms.

Castalia. *N. mexicana*, a native of Florida, Texas, and Mexico, bears a bright yellow flower on a stem rising above the water. *N. tetragona* is found in East Europe, Asia, and North America. It opens its small white buds at night. *N. fennica* has small white or pink flowers; *N. candida*, from the north of Europe and Asia, also small white flowers. *N. alba* is a variable species from Europe and North Africa. Its pure white flowers last about four nights. The variety *rubra*, from Sweden, has pink petals. *N. odorata*, from South Virginia flowers in the day from June to October; the pure white blooms are sweet scented. The seed is either sown as soon as ripe or kept in cold water till the spring. The white variety *minor* and the red *rosea* are rare; *gigantea*, from Mexico and Cuba, opens its white flowers at night. *N. tuberosa*, from Arkansas, opens its large white flowers in the daytime from July to December.

Lotus. *N. Lotus*, a native of Egypt, Madagascar, Central and West Africa, bears rather large white flowers often suffused with pink. *N. Zenkeri*, from the Cameroons, has small white flowers in July. *N. pubescens*, from Java, Australia, and the Philippines, and *N. rubra*, from Bengal, are night bloomers. The former is white and the latter purple.

Hydrocallis. *N. amazonum* is an interesting species from Jamaica, Guiana, Brazil, and Mexico. *N. Rudgeana*, from Central America, opens its greenish-yellow blossoms at night. *N. blanda*, from Guiana, Guatemala, and Jamaica, and *N. lasiophylla* and *N. tenerinerva*, both from Brazil, are white. *N. Gardneriana* is found in Brazil and Paraguay with red petals.

Hybrids. *N. × pennsilvanica* is a fine hybrid of *N. coerulea* and *N. zanzibariensis*. The pale blue flowers are open day and night.

Beautiful hybrids are also obtained by crossing *N. zanzibariensis* with *N. capensis* (blue), *N. elegans* (blue), and *N. flavo-virens*, the latter yielding *Grayae*, 'W. Stone,' *astraea*, and *gracilis purpurea*. *N. zanzibariensis rosea* and *flavo-virens* produce the pink or red hybrids, *Mauvii*, 'Mrs. C. W. Ward,' *astraea rosea*, *gracilis rubra*, *rosea perfecta*, and *rosea*.

Castalia. The following are derived from *N. tetragona*: crossed with *mexicana*, *pygmaea helvola* and *tetragona helvola*, both yellow flowers; with *alba*, *pygmaea alba*, with *alba rubra*, *Leydeckeri rosea*. *N. odorata sulfurea* and *sulfurea grandiflora* are hybrids of *mexicana* and *odorata*. *N. 'Arc en ciel'* has sweet-scented salmon-coloured flowers. It is a hybrid of *odorata rosea*. Many hybrids have been obtained from *alba*; bright yellow, *Marliacea chromatella*, *chromatella*, *tuberosa flavescens*; white *alba candidissima* and *Marliacea albida*; pink, *Marliacea carnea*, *M. rosea*, and 'W. Doogue.' From *N. alba rubra* are derived *Robinsoni*, *Seignonetti*, *aurora*, and *fulva*, with pink centres and yellowish petals on the outside. *N. odorata rosea* is one of the parents of the pink-flowering *caroliniana*, *c. perfecta*, *c. rosea*, *tuberosa superba*, *odorata caroliniana*, *o. superba*, and *o. suavissima*. *Tuberosa rosea*, *Brakeleyi rosea*, and *tuberosa rubra* also have pink flowers. *N. colossea* has large flesh-coloured flowers and is a persistent bloomer. It is probably a hybrid of *alba candidissima* and *odorata rosea*.

The following are hardy: *N. chrysantha*, *N. aurora*, *N. Moorei*, *N. Phoebus*, and *N. indiana*, yellow; 'Vesuvius,' 'Sultan,' 'Attraction,' 'Darwin,' 'Froebeli,' and 'Murello,' red; 'Albatross,' 'Hermine,' and 'Vomerensis,' white; 'Mrs. Richmond,' 'Odalisk,' 'Goliath,' and 'Masaniello,' pink.—S. E. W.

Odontioda × 'Coronation.' By Firmin Lambeau (*Rev. Hort.*, p. 578, Dec. 16, 1913; coloured plate).—The plate splendidly represents this beautiful orchid, a bi-generic hybrid between an *Odontoglossum* and *Odontioda* × *Vuytstekei*, the latter being itself a bi-generic one between *Cochlioda Noezliana* × *Odontoglossum Pescatorei*. The brilliancy and delicacy of the colours and their arrangement defy description, and the plants deservedly obtained the "Bull" Cup at our great International Exhibition in 1912 for the most beautiful *Odontioda*.

C. T. D.

Olive Oil, Deodorized (*Rev. Hort. de l'Alg.* March 1913, p. 121).—A German patented process is being employed in the South of France by which the commoner ranker olive oils, hitherto only suitable for industrial purposes may be transformed into an article of food. The oil is neutralized, deodorized, and the colour altered, and in its refined form is invading the markets of Nice, Marseilles, and Salon in increasing quantities. The question is now arising in the trade as to whether there is really no chemical difference between these artificially refined oils and the choice virgin product.—M. L. H.

Oranges, Mandarin, Pear-shaped. By J. Durin (*Rev. Hort. de l'Alg.* July 1913, p. 270).—It is sometimes supposed that the pear-shaped mandarins which come into the market are the produce of a distinct variety of Citrus. This has, however, been proved not to be the case. The peculiarity is never transmitted by grafting, and may be produced at any time, as the result of extra irrigation and of excessive applications of manure, especially if this is nitrogenous.
M. L. H.

Onion Seed Growing, 'Denia.' By Fabian Garcia (*U.S.A. Exp. Stn., New Mex., Bull.* 82; March 1912; plates).—An account of some experiments in raising the Spanish onion in New Mexico. So far the Spanish or Denia onion has not been grown on a commercial scale in the United States. It has been proved, however, that this onion will grow and thrive and ripen seed in many localities in New Mexico, and the quality of the home-grown 'Denia' onion seed is fully equal to that of imported seed, the price of which is almost prohibitive to the American farmer.—*M. L. H.*

Orchid, An, with Explosive Flowers.—Dr. H. N. Ridley (*Straits Settlements Gard. Bull.* vol. i. 1913, pp. 191-3) describes an orchid from Sarawak which shows a remarkable floral mechanism. This species (*Plocoglottis porphyrophylla*) is widely distributed in Malaya, but, being inconspicuous and a lover of deep shade, is but little known. It bears only one flower open at a time, but remains in flower for over three months, producing a fresh flower every few days until the raceme is more than two feet long and has borne about fifty flowers. In the young flower the ovary begins to twist, as usual in orchids, until it has overtopped the bract; it carries the swelling bud through about 75 degrees and then stops twisting. During this twisting the dorsal sepal outgrows the other two sepals and pushes over the apex of the bud. All the sepals at this stage are similarly narrowly ovate, the lateral ones asymmetrically so. The lateral petals are linear and curved round the column to meet at their tips. The lip is about as broad as long, cuspidate above its broad shoulders, with the margins in the lower part frilled and turned under; if these margins are uncurved it is seen that they are the lateral lobes of the lip. Under each broad shoulder a wart has begun to form. Between this stage of the bud and maturity the following changes occur: The contiguous halves of the lateral sepals thicken from the middle upwards; the cuspidate tip of the lip turns back, its shoulders enlarge and the warts become sharp little upstanding cones, while the side lobes increase along their margins so that they are too full for the space they have, and towards the base of the lip tend to form an upstanding rounded crest; two very fleshy staminodes lie within the curve of this crest, one on each side. In opening, which occurs in late afternoon or early evening, a slit appears between the lateral sepals, then these sepals break away and slowly take up a position at right angles to the ovary,

and their thickened areas become convex inwards and throw the thin parts back ; then the lateral petals rapidly elongate, curving over strongly so that their points pass between the bases of the lateral sepals, and in this curious action they deflect the lip on to its base, holding it down against a certain amount of resistance, in contact with the lateral sepals : thus the flower gapes somewhat. During the night the dorsal sepal turns back and the lateral petals straighten. The upper lateral sepal, no longer held away from its fellows by the lateral petals, now moves down to be in contact with it, and is thus almost median as regards the lip, and as the lateral sepals move away the lip is caught against its convex swelling and held folded down as the lateral petals placed it. A touch now frees the lip and causes it to spring up against the column. It is apparently fertilized by rather small insects which, attracted to the flower, are trapped by the upspringing of the lip against the column, and in struggling to free themselves effect pollination. The mechanism is very curious : the lip is a trigger put into place by the lateral petals and held there by one of the lateral sepals. This alone makes it of unusual interest, but this is heightened by the angle at which the flower stands, by the movement out of the median line of the column, and by the movement towards it of a lateral sepal. The flower has apparently no scent and no free honey ; its colours are lemon-yellow to yellowish green, with deep crimson markings on the lip, and the swollen parts of the lateral sepals are maroon.—*F. C.*

Palmetto, A New Ornamental. By O. F. Cook (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 113 ; Feb. 1913 ; pp. 11-14).—A handsome palmetto, which may find a place in the front rank of ornamental species, has been discovered at Victoria, Texas. It seems necessary to recognize it as a new species, and the name *Inodes exul* is proposed for it, in allusion to the fact that the original habitat is unknown, though it is considered probable that it will be found in some part of northern Mexico. The diagnostic characters at present available are the large size, the deep green foliage, the thickened branchlets of the inflorescence, the solitary fruits, and the large seed, not wrinkled above nor hollowed out below.—*A. P.*

Palms in the Botanical Gardens at Buitenzorg. By L. Pynaert (*Rev. de l'Hort. Belg.* March 15, p. 16 ; March 31, p. 92 ; June 15, p. 202 ; 1913 ; plates).—A series of articles on the distribution of the Palm family over the globe, with a classification and description of all known varieties, and an illustrated account of the wonderful collection of Palms in the Botanical Gardens at Buitenzorg, in Java.—*M. L. H.*

Papaya, The Grafted, as an Annual Fruit Tree. By D. Fairchild and E. Simmonds (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 119 ; March 1913 ; pp. 3-13 ; 4 figs.).—It is doubtful whether there is any fruit tree that grows as rapidly as the Papaya (*Carica Papaya*), or

yields as heavily in so short a time, and yet up to the present it has been grown on a seedling basis, so that it has been impossible to select strains and keep them pure. The species is dioecious as a rule, so that half the seedlings may be males, and only 5 or 6 per cent. of the remainder may produce fruit equal in quality to that from which the seeds were obtained, and in practice the results are often much worse than this. One of the writers of the paper has successfully grafted the Papaya, and the method of doing it is here described. A bearing tree in ordinary circumstances has no bud wood for grafting purposes, but if such a tree is decapitated shoots begin to form, one from the upper part of each leaf scar, and these, after three or four weeks, may be used for grafting on young Papaya seedlings raised in a greenhouse from seed sown a month or six weeks previously. A single March-budded plant will bear from two to three dozen fruits, averaging two to three pounds each, during the following winter and spring. It is suggested that certain close relatives of the Papaya might be used as stocks or for breeding purposes, nothing apparently having been done hitherto to hybridize the different species of *Carica* or make use of them as stocks.—*A. P.*

Parasites of *Coccus hesperideum* in California. By P. H. Timberlake (*Jour. Econ. Entom.* vi. p. 293 ; June 1913).—The soft scale (*Coccus hesperideum*) of the orange was at one time a serious pest of the orange groves of California. The combined attacks of parasitic insects and fumigation have effectively held it in check. The present communication gives an account of the life-histories of the chief parasites of the scale.—*F. J. C.*

Peach "Stop Back." By L. Haseman (*Jour. Econ. Entom.* vi. pp. 237-240 ; April 1913).—The author found the "tarnished plant bug" (*Lygus pratensis* Linn.) was answerable for the destruction of buds of peaches and other plants. The insect (which is not infrequently a destructive pest in English gardens) is a general feeder, and the author recommends the destruction of weeds, trapping on crops sown for the purpose, and capture on sticky boards as the best means of checking the pest. Spraying is unlikely to be efficacious.—*F. J. C.*

Peach Tree Aphides. By C. B. Hardenberg (*Agr. Jour. Cape G. H.* vol. vi. No. 2, pp. 224-235 ; Aug. 1913).—This is a Report on Investigations during late Winter and early Spring, 1912. Mention is made of both black and green peach aphides. Generally three sprays are given at intervals of four or five days, but owing to the lateness of the spring rains four (sprays) were given in 1912. The total cost of spraying is 2s. a tree ; in an ordinary year with three sprays it would be 1s. 6d. a tree. "Tobacco extract at a solution containing about 0.082 per cent. nicotine is the most effective strength. No advantage is gained by a stronger solution. This kills the aphid within 24 hours."

"The tobacco wash is more effective in sunshine than in dull cloudy weather."

"The use of soap at the rate of 1 lb. in 25 gallons of spray is advisable."—A. A. K.

Pear, Precooling and Storage of Bartlett. By A. V. Stubenrauch and H. J. Ramsey (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 114; Feb. 1913; pp. 19-24).—There are now approximately 50,000 acres of pear trees in the Rogue River Valley of Oregon, and by far the larger portion of this acreage consists of Bartletts. Preliminary investigations have been conducted with a view to ascertaining the practicability of extending the period during which they can be placed upon the market. The results indicate that the season can be extended six or seven weeks by leaving the fruit on the trees a fortnight longer than is at present usual, and storing it for four or five weeks in a temperature of 32° to 34° F. after the fruit has been precooled.—A. P.

Pears, Keiffer Hybrid (*Agr. Jour. Cape G. H.* vol. v. No. 5, p. 769, May 1913; pl.).—The plate shows two pears of the above variety, one four-and-a-half, the other five inches in height.—A. A. K.

Persimmons. By S. H. Hastings (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 120; April 1913; p. 16).—The native Texas persimmon (*Diospyros texana*) was long regarded as a probable stock for the Japanese species (*D. Kaki*), but attempts to produce a union failed. This has now been accomplished by inarching the Japanese persimmon on seedling plants of *D. texana*.—A. P.

Phryma. By Theo. Holm (*Bot. Gaz.* Oct. 1913, pp. 306-318; 3 pl.).—*Phryma leptostachya* is a sciaphilous type with very open pneumatic tissue. Mechanical tissues (stem and leaf) are poorly developed. There are no root shoots, and but few buds borne by a short pseudo-rhizome. The hooked teeth of the persistent reflexed calyx are well adapted for dispersing the seed.—G. F. S. E.

Phyllocactus Hybrids. By C. Reiter (*Gartenflora*, vol. lxiii. pt. ii. pp. 46-49).—Phyllocactus thrive in well-drained pots containing sandy loam with small pieces of brick and dried cow dung. In winter keep the plants in a room from which frost is excluded, and move them in summer to a sunny position in the open, give them plenty of water, and occasionally liquid manure. The following are large-flowered varieties: 'Andromache,' carmine; 'Antigone,' the best white; 'Helena,' brilliant pink; 'Iphigenia,' silky pink; 'Ismene,' pale lilac; 'Magnolia,' like a pink Magnolia; 'Nausicaa,' dark pink; 'Stella,' pure white; 'Victoria Regia,' resembles the flower of a *Victoria Regia*; 'Violetta,' violet. 'Pheasant' is dark brownish-red with a magenta centre; 'Peacock,' chamois and magenta; 'Phoenix,' old gold, bronze, and magenta.

Worthy of mention are also 'Aida,' chamois suffused with terracotta; 'Brilliant,' scarlet; 'Cupido,' rosy flesh; 'Inka,' terracotta and orange; 'Kermesinus magnus,' large carmine flowers with magenta centres; 'Leda,' white; 'Leucotheca,' white with green centre; 'Limoneus,' citron with white centre; 'Luna,' yellow; 'Mona,' dark red; 'Miranda,' heliotrope; 'Nymphaea' is like a yellowish-white Water Lily; 'Pelagia,' bright pink; 'Venus,' pink.

P. anguliger bears milk-white flowers, smaller than the hybrids. *P. phyllanthoides* 'Deutsche Kaiserin' is very floriferous. Its blooms have the same colour as the rose 'La France.'—S. E. W.

Picea Mariana, Layering of. By George D. Fuller (*Bot. Gaz.* June 1913, pp. 452-457; 6 figs.).—The Black Spruce forms "layers" freely in certain pioneer forest associations along the Saguenay River, Quebec (Chicoutimi), which are found on granitic hills exposed to the full sweep of the wind and where there is very little soil.

Besides the Black Spruce, *Pinus Banksiana*, Paper Birch and Aspen are abundant. The prostrate branches become covered with moss, dead leaves, &c., and give out roots. Then young upright stems often appeared, so that circular areas with a radius of 2-4 mètres became covered with vigorous young trees. Often large clumps of small trees (six to twenty) could be referred to a single parent. This layering was not noticed in *P. Banksiana* and seldom in *Picea canadensis*, which rarely occurs in exposed rocky situations.

G. F. S. E.

Pigmentation and Assimilation in Plants. By A. von Richter (*Ber. d. deutsch. bot. Ges.*, Bd. 30, pp. 280-290).—The author has made a thorough investigation of the process of assimilation in green, brown, and red Algae at Naples. The Algae were placed in large glass cylinders filled with sea-water of known carbon dioxide content; plants of the differently coloured Algae were exposed simultaneously, some to pure sunlight and others to coloured lights (obtained by interposing spectroscopically pure coloured screens), while in other series of experiments the assimilation of green, brown, and red Algae in light of varying intensities was determined. At the end of each experiment the water was analysed for carbon dioxide, and the diminution of this gas and the increase in oxygen were noted. From the results the author concludes that the most important factor determining the rate of assimilation in differently coloured Algae is not the colour of the incident light, but its intensity; that among marine Algae, as among ordinary land plants, some species are "light-loving" and others "light-avoiding"—or, expressed in terms of Wiesener's *Lichtgenuss* theory, some require a relatively high light intensity and others a relatively low intensity; that the distribution of marine Algae in vertical zones is related to these differences as to *Lichtgenuss* in the different species; that the pigments additional to chlorophyll in Brown Algae (phycophaein), Red Algae (phycoerythrin),

and Blue-green Algae (phycocyanin) play no active part in the process of assimilation; that this process is entirely attributable to the chlorophyll which is always present in Algae and all other plants capable of assimilation; and that the well-known and hitherto generally accepted "chromatic adaptation" theory of Engelmann requires thorough revision, since it does not account for, and is indeed rendered unnecessary by, the results obtained in the author's experiments.

F. C.

Pine Blister Rust, White. By P. Spaulding (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 129; June 1913; pp. 9-20; 6 figs.).—Contains information acquired since the issue of bulletin 206 in 1911 (see *R.H.S. Journal*, xxxviii. pp. 354-5). The conclusion that the inspection of diseased plantations recommended in that bulletin might result in the final eradication of the pest has not been borne out by experience, trees which were examined and pronounced sound having been found to be badly affected two years afterwards. The total removal and destruction of diseased plantations is recommended where possible. It has been generally supposed that the rust is carried from one locality to another only by means of infected white pine trees, but there seems sufficient evidence to suppose that the fungus may also be carried on dormant *Ribes* stock.—A. P.

Plasmolysis and Distilled Water, Apparent. By W. J. V. Oosterhout (*Bot. Gaz.* June 1913, pp. 446-451; 6 figs.).—The author figures and describes protoplasmic contractions of *Zostera marina* and *Polysiphonia* when treated with pure distilled water and also with fresh spring water. The process is irreversible. The increase of permeability is supposed to be due to the loss of certain substances, especially inorganic salts.—G. F. S. E.

Poinsettia, A New Race of (*Jour. Soc. Nat. Hort. Fr.* Jan. 1913, p. 29).—M. Adnet, of Antibes, is now showing several Poinsettias produced by hybridization. He already has several white ones in cultivation, and as a result of his experiences he believes that this plant, which has hitherto been considered intractably stable in its character, may in the near future be made to show a number of new forms and a wide range of fine colourings.—M. L. H.

Poison, Alleged Plants of New South Wales. By J. B. Cleland (*Agr. Gaz. N.S.W.* vol. xxv. pt. i. pp. 65-69).—Experiments indicate that the following plants do not poison sheep and calves: *Hibbertia diffusa*, *Omolanthus populifolius* (Native Poplar), *Indigofera australis*, *Exocarpus cupressifolius* (Native Cherry), *Cucumis myriocarpus*, *Macrozamia spiralis*, and *Xanthorrhoea* (Grass-tree).

S. E. W.

Poisoning by Conifers (*Jour. Bd. Agr.* vol. xx. No. 11, p. 994).—Whilst the Yew is the only Conifer which commonly causes poisoning

of live stock, it is quite possible that if eaten in quantity the foliage of some others would induce poisonous symptoms and even death in the animals concerned. It is noteworthy, however, that according to Pott the needles of *Picea excelsa*, *Abies pectinata*, *Larix europaea*, and *Pinus* sp. are, in the mountainous districts of Steiermark, Kärnten, and Tyrol, extensively fed to cattle and sheep—chiefly, perhaps, as an appetizer and in small quantities as a dietetic. *Juniperus* sp. are similarly utilized in some districts. To what extent the foliage may be eaten without harmful consequences is not known, but Pott states that large quantities can cause hæmaturia and similar effects. There is one record of *Cupressus macrocarpa* having been the apparent cause of the death of four bullocks, and in another instance the poisoning of three heifers, one of which died, was attributed to *Cupressus nootkatensis*.—A. S.

Poisons, Metallic. By C. B. Lipmans and F. H. Wilson (*Bot. Gaz.* June 1913, pp. 409-420).—The authors discuss the evidence regarding copper, zinc and manganese poisons on the growth of plants, and give the result of their own experiments.

Wheat and Vetch were grown in pots with various solutions of copper, zinc, and magnesium sulphate. With copper and zinc small amounts seemed to produce stimulation in Vetch but not in Wheat. Toxic effects were not observed as soon as is usual in such experiments.

According to the authors, both Wheat and Vetch are stimulated in the soil by manganese sulphate up to 800 parts per million for Vetch and 2000 for Wheat.

The authors also think that considerable amounts of sulphuric acid may be added to the soil without injury to plants.—G. F. S. E.

Poria, New Species of. By Adeline Armes (*Bot. Gaz.* May 1913, pp. 397-399; 6 figs.).—This new species was causing considerable damage to the timber in certain buildings, and resembles *Merulius lachrymans*.—G. F. S. E.

Potash Manuring and Market-Garden Crops (*Jour. Bd. Agr.*, vol. xxi., No. 1, pp. 39-43).—The article deals mainly with the effects produced on market-garden crops by potash starvation, as seen in the well-known experiments conducted by Dyer and Shrivell at Hadlow. The plots were laid out in 1894 in a field which was previously under ordinary arable cultivation, the soil being a poor clay loam or brick earth of lightish colour, resting on a deep bed of heavy clay. With the slight alterations suggested by experience obtained in the course of the trials, the plan of the experiments has been the same throughout, and in the case of most of the crops it is possible to observe the effect of withholding potash over a long series of years from crops grown both with and without a moderate dressing of dung.

From an examination of the figures in a table showing the average annual yield from an acre for a number of seasons it is evident that, on

the whole, an application of $12\frac{1}{2}$ tons of stable manure an acre has, on the Hadlow soil, fairly well satisfied the requirements of the different vegetables as regards potash. There were, however, slight increases from the addition of potash in almost every instance.

When, however, crops were grown with artificials alone (and it is interesting to note that, even on such inferior soil, the table shows that it is possible to grow many market-garden crops satisfactorily without dung) the necessity for the inclusion of potash is quite evident, and it is obvious that the different plants have suffered seriously when potash has been withheld. It is particularly marked in the case of Beet, Parsnips, Onions, and Celery.

The results in the case of bush fruits are not available for so long a period, but so far they are very similar to those obtained in the case of vegetables. The average crop of Gooseberries on the plot receiving no dung has been nearly trebled as a result of the addition of potash.

The results obtained in these experiments are all the more striking when it is remembered that of all soils clays are, as a rule, least benefited by potash manuring, and that nitrate of soda was the nitrogenous manure employed in every case. The Rothamsted experiments have shown that, as a rule, when nitrate of soda is used, potash manure is less necessary than when the nitrogen is derived from other sources.

The source of potash in the above experiments was sometimes sulphate of potash and sometimes kainit, the two being alternated; the quantity used per annum was 1 cwt. of sulphate of potash or 4 cwt. of kainit an acre.—A. S.

Potato Blight and Burgundy Mixture (*Agr. Gaz. N.S.W.* vol. xxv. pt. i. pp. 48–50).—Burgundy mixture is superior to Bordeaux because it adheres longer to the foliage and is easier to prepare. Burgundy mixture is prepared by dissolving 2 lb. of copper sulphate and $2\frac{1}{2}$ lb. of washing soda separately in water; pour the soda solution into the solution of copper sulphate and make up to 10 gallons with water. If the mixture turns blue litmus-paper red, add more washing-soda solution. Use as soon as made. Twenty pounds of copper sulphate and 25 lb. of washing soda are sufficient to spray an acre of Potatos.—S. E. W.

Potato, Bud Variation in (*Rev. Hort.*, p. 524, Nov. 16, 1913).—Abstract of report of MM. E. Heckel and C. Verne to the Société Nationale d'Agriculture and on experiments with tuberiferous *Solanums* collected in the Cordilleras by the latter. § They report that partial or total mutation has taken place with regard to *S. Commersonii*, *Maglia*, *tuberosum*, *immile* and *Jamesii*, and that other species show preliminary signs of mutation (for instance *S. Bitteri*). They consider that they are on the track of a strain immune from parasites.—C. T. D.

Potato, Powdery Dry-rot of the. By W. A. Orton (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 110; Jan. 1913).—Describes a new

dry-rot of the potato tuber starting from the outside and due to the fungus *Fusarium trichothecioides* Wollenw. The trouble appeared to be most frequent where the tubers were not stored until they had been out of the earth for some time.—*F. J. C.*

Potato, The Tuber-Unit Method of Seed Improvement. By W. Stuart (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ. 113*; Feb. 1913; pp. 25-31; 2 figs.).—The average yields per acre in Great Britain and Germany from 1901 to 1910 were 200·7 and 200·8 bushels respectively and in the United States 92·7 only, and the writer attributes this in part to the care exercised by the European grower in the selection of his seed supply. The most valuable feature of the method recommended consists in the elimination of unproductive and diseased plants rather than in the isolation of highly productive strains. Tubers weighing from 6 to 8 ounces are recommended for planting, these being cut into four. A careful study of strong and weak tuber units of twelve varieties during two seasons shows the average production of merchantable tubers from the strong plants to have been sixteen times greater than that from the weak ones.—*A. P.*

Potato Tuber, Dry-rot of the Irish. By E. M. Wilcox, G. K. K. Link, and V. W. Pool (*U.S.A. Exp. Stn., Nebraska, Research Bull. 1*, and *Bull. 134*; March 1913; figs.).—A new species of *Fusarium*, called by the authors *F. tuberivorum*, is found to cause winter rot of potatoes in the store. No other part of the plant can be infected by the fungus, and infection of the tuber is only through wounds (not through lenticels, eyes, or scab spots). Treatment of potatoes by immersion in formalin (1 pint to a barrel of water) for two hours and then drying, subjection to formaldehyde vapour (generated by placing 23 oz. potassium permanganate in 3 pints of formalin for treatment of 1000 c. ft.), and the 5-5-15 lime-sulphur wash were found to reduce the amount of rot in a very marked fashion. A considerable part of the bulletin is occupied by an account of the structure of the fungus and comparison with allied species. The second bulletin quoted is a popular edition of the first.—*F. J. C.*

Potentilla Clusiana. By Reginald Farrer (*Garden*, Jan. 4, 1913, p. 10).—A snow-white counterpart of *P. nitida* seems almost unknown. It is a species of the Eastern limestones, where it replaces *P. nitida* at considerable elevations on cliffs and rocky ridges. It is woody-rooted, and, though impossible to collect entire, the broken-off cushion can easily be made to root as cuttings. Its beauty and value are enhanced by its flowering in late summer, when almost everything but the Campanulas has gone to seed.—*H. R. D.*

Precocious Flowering. By Dr. E. Goeze (*Beih. Bot. Cent. xxx. Abt. 1, Heft 1*, pp. 114-121).—In general the age at which a plant flowers is a specific character. Dry conditions, dry soil and air, and a change in nourishment favour flowering. Moist or wet conditions,

on the other hand, favour the vegetative organs. In sheltered wet situations, trees bloom later than on exposed and dry ones.

Other suggested influences which may favour early flowering are too strong or weak insolation, an injury to some part of the plant, general weakness, unripe seed, wrong time of planting, and over-crowding in seedbed.

Such early flowering often precedes death, as *e.g.* with one to three year old Oaks, *Elder*, and *Acer rubrum*. Other plants which flower at two years old are *Potentilla fruticosa*, *Colutea*, *Cydonia Maulei*, and *Ceanothus americanus*. Herr Machet finds that basal shoots of Lilac de Marly (*Syringa vulgaris chamaethyrus* ?) bloom in their first spring. Hybrids of perennials may bloom in the first year after sowing, though their parents do not do so until the second or third year. "Hunger forms," as *e.g.* of *Papaver Rhoeas* and *Aira praecox*, scarcely an inch high, are also remarkably precocious. The 'Marronnier du vingt Mars' in the Tuileries at Paris used to flower at least fourteen days before its neighbours. Roses often blossom at a very early stage of growth, *e.g.* *Rosa indica*, after only the first leaf has developed—a Bengal rose 5½ cm. in height and with four leaves; *Rosa polyantha multiflora*, first year in nursery; hybrids of 'Frau Carl Druschke' × 'White Maman Crochet,' seed sown December 1910, flowered June 1911, and 'Caroline Testout' × 'Frau Carl Druschke,' sown February 1911, bloomed June 1911 (Veitch).

So also *Swicknia Mahagoni* sometimes flowers at a very early age. *Carica Papaya* has been known to ripen a fruit in six months. Other instances are *Colinus* at 25 cm. in height; *Pinus canariensis* at 3 feet; *Podocarpus Totara* at a height of 3 inches; *Dendrocalamus*, a bamboo which reaches 100 feet, blooms at thirteen months old and when 1 foot in height. Dwarf plants of *Melia arguta*, only 6–7 cm. high, bore a large flower which, however, was abnormal. So also Epacridaceae (*Styphelia*, *Brachyloma*) 1½ inch long; *Needhamia Pumilio*, *Pentachondra pumila*, and *Simsia tenuifolia* flower in their first year. So also *Astartea fascicularis*, *Hakea ambigua*, *Leucopogon gibbosus*, *Petrophila diversifolia*, and *Laportea usneoides* var. *nana* are sometimes very precocious flowerers.—G. F. S. E.

Prickly Pears of Australia. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxiv. pt. x. pp. 863–866, 973–974, and 1073–1076; 4 figs.; 3 col. plates).—*Opuntia dejecta*, *O. Dillenii*, and *O. monocantha* are described.—S. E. W.

Primula pseudosikkimensis. Anon. (*Garden*, June 14, 1913; p. 303).—The Himalayan Cowslip, *P. sikkimensis*, is one of the most graceful of the Primulas inhabiting wet, boggy localities in the Indian mountains at 12,000 to 17,000 feet. *P. pseudosikkimensis*, which has been flowering at Kew, differs little from the type except that it is a native of China, stronger in constitution and of more robust habit, and they are without doubt geographical forms of the same

species. Both are hardy, and love a deep, moist, well-drained soil and a shady place. Propagation is by division or seeds, sown as soon as ripe.—*H. R. D.*

Primulas, New (*Gartenflora*, vol. lxii. pt. xxiii. pp. 506-508).—There is no difficulty in growing the new Primulas *Bulleyana*, *Cockburniana*, *pulverulenta*, *Veitchii*, 'La Lorraine,' and *Juliae*. They should be planted in well-drained beds of light soil, rich in humus. Shade from the sun at noon and give some protection in winter. 'La Lorraine' is an improvement on *Veitchii*, as it is more vigorous in growth and more floriferous. The flowers are carmine-pink with a yellow eye.—*S. E. W.*

Pure Strains of Plants, Can Selection Improve the Quality of? By C. Hagedoorn and A. Hagedoorn (*Jour. Bd. Agr.* vol. xx. No. 10, pp. 857-860; plate).—The authors briefly discuss the belief, to which many people adhere, that as soon as selection ceases the variety will begin to deteriorate. The experiments of Johannsen, who concluded that selection had no effect whatever on a pure strain, are cited. These experiments, however, have been regarded as inconclusive because of the small number of generations during which they have been made. A comparison of specimens of wheat selected by Louis de Vilmorin about 1850 with plants of the same strains grown in 1911 leads the authors to the conclusion that in no respect have the sixty years of selection produced a change. They are of the opinion that once a strain is pure for all its genetic factors it is possible to grow its seed year after year without fear of its deteriorating. "Wheat, or barley, or oats can be of so pure a strain that no amount of selection can possibly ameliorate them, and no amount of selection in the opposite direction can deteriorate them."

"On the other hand, in the case of habitually cross-fertilized plants, such as rye and beet, continued selection by experts is most necessary in order to keep the quality of the seed up to the standard, as under practical conditions no really pure strain can ever be produced by such plants. In these plants the seed deteriorates by multiplication without selection, and it is very probable that, by an unwarranted generalization, it has come to be believed that the same holds true for all agricultural plants."—*A. S.*

Pyrethrum of Dalmatia, The, Its Growth in Provence (*Jour. Soc. Nat. Hort. Fr.* May 1913, p. 270).—Some experiments in cultivating *Pyrethrum cinerariaefolium* in Southern France with a view to the production of Pyrethrum powder were made some years ago and proved quite successful from the cultural point of view. The plants did well, flowered freely, and proved both to be more flourishing and to produce flowers containing a larger percentage of the active principle of the Dalmatian insecticide if they were left to themselves with the minimum of cultural care. The industry was afterwards abandoned in France, however, as it was found that

the price of the powder in the market was not enough to cover the high cost of harvesting. Four kilogrammes of fresh flowers are required to give 1 kilo of the dried flowers, and at that time the wholesale price at Marseilles was only 3 frs. 50 per kilo. The late wars in the Balkans, however, have so seriously affected the supply of the powder from Dalmatia that the same powder now fetches 10 francs per kilo, and cultivators in France, Algiers, Morocco, and Tunisia are being advised to experiment with this crop.—*M. L. H.*

Raisin Seeds, The Utilization of Waste. By Frank Rabak (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 276; March 1913; 3 figs.).—Describes investigations undertaken with the object of preparing products of commercial value from this waste material, of which it is estimated three to four thousand tons are available each year. This is in addition to the grape seeds and wine residues, grape-seed oil being an important product of the wine regions of France and Italy, where it is used as an edible oil and in the manufacture of soap. The investigations described show that, in addition to the oil, raisin seeds will yield a clear transparent syrup, tannin extract, and meal, the last of which, on account of its high protein content—12 per cent.—should be useful as part at least of a stock food ration, though this would have to be determined by actual feeding experiments. Production of the tannin extract is practicable only in the case of raisin seeds, wine residues being probably largely depleted of this element.—*A. P.*

Ramie. By L. H. Dewey (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 103; Dec. 1912; 2 figs.).—Ramie (*Boehmeria nivea*) has been an important fibre-producing plant in China for many centuries, and its use in the western world is now increasing. It is an herbaceous plant, growing from 2 to 6 feet in height, similar to the nettle in appearance, to which family it belongs, but without stinging hairs. A warm, moist climate is essential for its successful cultivation, with a rich, deep, moist soil, not subject to drought. The yield of dry fibre is from 3 to 5 per cent. of the weight of the green crop, or 15 to 20 per cent. of that of the air-dry stalks, and this is the only part having any market value. The importations into the United States of China grass (ramie fibre cleaned by hand in China) amount to about 1,000,000 lb. annually. Instructions are given for the growth of the crop and the preparation of the fibre.—*A. P.*

Rhododendrons, Poisoning by (*Jour. Bd. Agr.* vol. xx. No. 12, pp. 1093-1094).—A case has recently been brought to the notice of the Board of Agriculture in which the loss of several cows has been attributed to poisoning by *Rhododendron ponticum*. Animals do not appear to eat Rhododendrons very extensively, but from the various references to literature given it would seem that there is no doubt as to the poisonous character of a number of species of Rhododendron, and indeed most species are suspected. Both the leaves and flowers are narcotic, and even the honey in the flowers is regarded with suspicion.—*A. S.*

Rhubarb Weevil. By H. B. Weiss (*Jour. Econ. Entom.* v. p. 434; Dec. 1912).—The common dock (*Rumex crispus*) is the favourite food of the weevil (*Lixus concavus*). The larvæ feed in the stem which they burrow, and it is suggested that cutting the dock in damp weather when it is likely to decay will cause the death of the contained larvæ. The insect apparently hibernates as an imago.—F. J. C.

Romneyas. Anon. (*Garden*, June 7, 1913, p. 291; fig.).—Until about fifteen years ago only one species (*Romneya Coulteri*) was known. In 1898 Miss Eastwood, curator of the Herbarium of the Californian Academy, proved the existence of a second species, which she described as *R. trichocalyx*. Both are natives of California. The date of introduction of *R. trichocalyx* is unknown, as it was cultivated as *R. Coulteri* before 1898. The first recorded flowering of the new species was in 1902, in the garden of Mr. H. C. Baker (Gloucestershire). *R. trichocalyx* is less vigorous in habit than *R. Coulteri*, producing more growths, but the stems are thinner and more leafy. The buds of *R. trichocalyx* are round and hairy, those of *R. Coulteri* being smooth and pointed. *R. trichocalyx* does not possess the thick tall stems, upright habit, and the substance of the less divided leaves of *R. Coulteri*.

When once planted the Romneyas should not be disturbed, for any interference with the fleshy roots is detrimental to the plant. Until, therefore, the final position is decided on they should be grown in pots.

The easiest and most satisfactory propagation is from seed, sown as soon as ripe. *R. Coulteri* grows from 5 to 7 feet high, *R. trichocalyx* 3 to 5 feet.—H. R. D.

Root Pruning by Dynamite (*Garden*, March 29, 1914, p. 154).—The treatment of a batch of young apple trees growing too luxuriously in this fashion is described. A hole is bored about 15 inches from the trunk with a stout crowbar in a slanting direction to a point about 2 feet 6 inches deep, about the centre of the tree. A cartridge with a long fuse is then inserted, and the hole filled and rammed; a light is then applied, and the operator moves away. At the explosion there is an upheaval of the soil and the thick roots are torn asunder. The soil is then adjusted and made firm again. The operation on thirty-two trees took less than an hour.—H. R. D.

Rosa sertata (*Garden*, Aug. 23, 1913, p. 417).—A new wild Rose from China, sent home by Mr. E. H. Wilson, who also introduced two other recent additions to our wild Roses, *R. Moyesii* and *R. Willmottiae*. It forms an attractive bush, 4 to 5 feet high, with elegant glaucous green foliage. From mid-June onwards for a month or more appear a profusion of delicate rose-pink blooms, 2 inches or rather more in diameter. These are followed by quantities of bright red fruits which hang in small clusters, two, three, or more together,

from the long arching growths. The fruits are about three-quarters of an inch long, subglobose or urceolate. *R. sertata* will make a nice Rose for hedges, being well furnished to the base.—*H. R. D.*

Roses Climbing under Glass. By Jos. Paelinck (*Rev. de l'Hort. Belg.* June 30, 1913).—Some hints to the amateur on the planting and management of roses under glass. These are said to do much better if they are trained, not on the back wall of the house but under the glass like vines, only in this case there must be a space between them and the roof or the buds will be liable to rot. Directions on pruning are given, and the relative value of six or seven varieties is discussed. These varieties include 'Maréchal Niel,' 'Gloire de Dijon,' 'Rêve d'Or,' 'Comtesse de Bouchaud,' 'Mme. A. Carrière,' 'La France de 1789,' 'Triomphe des Noisettes.' Of these the first two are treated of as indispensable, and 'La France' and 'Triomphe des Noisettes' are mentioned as the most thoroughly satisfactory in the writer's opinion.—*M. L. H.*

Roses, New (*Gartenflora*, vol. lxiii. pt. v. p. 116).—'Papa Héméray,' a hybrid of Hiawatha and the Bengal rose, is a robust grower, bearing brilliant blood-red single flowers with white centres. The Polyantha Rose 'Le Ponceau' ('Gruss an Teplitz' × 'Mme. Norbert Levavasseur') is a robust grower, resisting mildew. Its flowers are beautiful coral-red in colour, and the foliage is very attractive.—*S. E. W.*

Salvia splendens 'Bouquet Rose' (*Rev. de l'Hort. Belg.* Feb. 15, 1913, p. 43).—This new *Salvia*, of a colour hitherto unknown among *Salvias*, has proved to come true from seed, and is a valuable acquisition.—*M. L. H.*

Sand-dunes and their Flora. By J. Jesuret (*Beih. Bot. Cent.* xxx. Abt. 2, Heft 3, pp. 269-391; 3 pl. and 9 figs.).—This paper, on the history of the development of the flora of the dunes of Holland, contains a whole series of observations on the soil, meteorology, water-supply, and the effect of dew, wind, and sunshine on the growth and habit of dune plants. There are also meteorological observations of great interest to botanists, and observations on the effect of a covering of sand, of dead vegetable matter, as well as on the growth and habit of bracken. Some of these might be of importance to horticulturists.

The author finds that in post-glacial and historic times there have been two wet and three dry climatic periods.

The formation of the older dunes dates back to the prehistoric period. In the second dry period they extended both westward and to the east. In the following wet period (600 A.D.) they were overgrown by forests of Scots Pine, Oak, Alder, &c. At this time the sea invaded Holland, and many of the dunes were destroyed.

About 1100 A.D. another dry period began. The Spruce was able to invade part of this area. Later the new series of dunes began to develop.

In both old and new dunes the sand consists mainly of quartz, which with orthoclase and "Kalkspat" groups forms 95 per cent. The particles are chiefly from $\frac{1}{4}$ to $\frac{1}{2}$ a millimetre in size. The old dunes are very poor in lime.

The very youngest dunes (*Triticum*) contain many shells and but very little humus: the soil is porous and often in movement. When mosses and lichens fix the surface, there is no longer the same violent fluctuation in temperature and water contents. So humus can accumulate and a fairly luxuriant vegetation can establish itself.

On dunes of this kind, especially where Restharrow is abundant, a crop can be raised.

But anything which interrupts the vegetation covering can start the movement of the dune, for the wind gets at any bare places. Fields when abandoned, people gathering sticks, or even rabbit holes, may in this way start the movement of the dune.

There is an extraordinary variation in the conditions at various points on a dune. The author gives charts and tables showing differences in temperature. With an air temperature (at 150 m.) of 15° C., the south slope was 39° and the north 17°. Then with air temperature of 16½° C., sand was 22° and grass 25°. Dew is heaviest on the tops and in the windswept sandy places. Hollows in the dunes are apparently sinks into which the cold air flows, so that late frosts at night kill young oak leaves in a hollow whilst those on the dunes above are uninjured.

These differences are manifested by the plant covering. On north-west slopes there may be thick tufts of *Polypodium vulgare* and *Botrychium*, whilst on the south-east of the same dune there is an open flora of *Hippophaë*, *Rubus caesius*, *Rosa pimpinellifolia*, *Ammophila*, and *Festuca rubra arenaria*. Seedling trees also occur in the dune valleys and on the north-west slopes.

But in the older dunes the lime has been almost wholly washed out of the soil, especially during the wet period which followed on their formation. Not only lime but other salts are carried downwards, and may be lost in the water-table.

But in certain places, the water rising from the underground water-table meets the rain-water percolating downwards, and a sort of hardpan (*ortstein*) is formed which is impervious. Such places may become pools in winter and quite dry in summer, or may form peaty hollows.

It is for the above reason that the older dunes do not yield a satisfactory return when cultivated, even if manured, and trees grow very slowly on them. Most of them seem to be overgrown by *Calluna* or by bracken, which is apparently sometimes 9 feet in height when more or less sheltered and with water at 2 feet depth. The present flora is mostly a xerophytic heath flora, which is alone able to establish itself under such conditions.

The rain-water in the dune area sometimes remains fresh, floating, so to speak, in the soil above the sea-water.

These water conditions and the liability to covering by blown sand produce extraordinary variations in the growth of roots. A four-weeks' old *Eryngium maritimum* had a root 3 feet long and a hypocotyl 20 cm. long. When again covered by sand the (first) leaf-stalks elongated by intercalary growth. An *Oenothera* had a root 10½ feet long and covered an area of 21 feet in diameter. Elder is often planted as a protection on the dunes.

In storms, the sand blown by the wind is apt to do much damage to hyacinths and tulips. In consequence windscreens of *Thuja occidentalis* or other quick-growing plants are required.—G. F. S. E.

Saxifrage Hybrids. By Mrs. Lloyd Edwards (*Garden*, Sept. 27, 1913, p. 485; coloured plate).—The authoress gives an account of how she raised a number of hybrid saxifrages, beginning with a chance seedling called Apple Blossom, probably from Guildford's seedling × *S. hirta*, and including *S. Clibrani*, *S. sanguinea superba*, *S. rosea superba*, 'Rose Beauty,' and others.—H. R. D.

Scale, Pernicious. By C. P. Lounsbury (*Agr. Jour. Cape G. H.* vol. vi. No. 4, p. 663, Oct. 1913).—In the report on the present position with regard to this pest it is stated that lime-sulphur wash and "scalecide" were the spray fluids chiefly employed, and both proved highly efficient. "The experience of the past year has amply demonstrated that spraying as a suppressive measure is cheap and highly satisfactory, and has also demonstrated that good spraying has a very decided value in retarding local spread. One thorough spraying every winter is evidently all that is required to prevent damage to a tree; but two or three thorough sprayings in one winter may be necessary to get the pest well under control in the case of trees which have been allowed to become badly infested by neglect in one or more years."—A. A. K.

Scelopendrum vulgare var. **Daedalea**. By E. Bouvel (*Rev. Hort.*, p. 53, Feb. 1, 1914; 1 ill.).—This variety, found wild near Chapelle-Basse-Mer (Loire Inférieure), bears a well-developed flat crest, divided into two, with broad flabellate terminals. The spores, being sown separately, some from the crest and some from the normal base, have yielded, it is stated, typical plants from the former and purely normal ones from the latter, thus refuting, as far as it goes, the theory until now accepted, that the abnormal influence pervaded the frond instead of being merely confined to the abnormal portion. This appears to have been the case with several successive trials—an interesting fact, but requiring further experiment on similar lines.

C. T. D.

Seedcoats, Semipervious Nature of. By Charles A. Shull (*Bot. Gaz.* Sept. 1913, pp. 169-199; 9 figs.).—The author found that the seedcoat of *Xanthium* (like that of *Nordeum*) is not impermeable but semipermeable. A power of selection is shown; certain substances such as copper sulphate, sugars, glycerol, hydrochloric and

tartaric acids are excluded, as well as dry alcohol, ether, chloroform and acetone when the seedcoat is dry. Oxygen also does not diffuse through absolutely dry seedcoats. On the other hand, when the seedcoat is wet, alcohol, ether, iodine, potash, and sodium hydrate, various nitrates and acids (nitric, acetic, lactic, and citric) enter "slowly or rapidly."

This relative influence on absorption is exercised by the inner membranous layer of the seedcoat (probably originally the nucellar membrane), which is of nearly pure cellulose, but perhaps contains some tannin.

Treatment with tannin solvents does not destroy semipermeability. Six different families of plants—Alismaceae, Grasses (Barley, Wheat, and Oat), Sugarbeet, Rosaceae (Peach, Apple), Leguminosae, and Compositae—also possess semipermeable seedcoats.

Even minute injury to the seedcoat (not perceptible to the naked eye) may result in allowing free entrance to substances which would otherwise be excluded.

These results have an important practical bearing on experiments concerning germination, especially in the use of stimulants to germination and of fungicides and insecticides, for many observers have not known that the seedcoat is semipermeable.

The author also points out that the capillary and imbibition force of the embryo of *Xanthium* amounts to about 965 atmospheres when the seed is air-dry, and 590 atmospheres with an increase of 7 per cent. in the air-dry weight of the embryo.

These high values are compared with the results of Rodewald, who found that dry starch on swelling develops a pressure of 2523 atmospheres.—G. F. S. E.

Seedweight of Bean, Correlations regarding. By J. Arthur Harris (*Beih. Bot. Cent.* xxxi. Abt. I, Heft 1, pp. 1-12; 4 pl. and 4 figs.).—This is a quantitative study of the factors influencing the weight of the bean seed so far as intraovarial correlations are concerned.

Five series, comprising 23,312 individually weighed seeds, are shown in condensed tables, and the results are examined biometrically.

The number of ovules is practically negligible as a factor influencing seedweight (coefficient from -0.0071 to $+0.0052$ grams). Weight of seeds decreases as the number of seeds per pod increases. Correlations average only -0.06 . For relative number of seeds as compared with ovules per pod the correlation is -0.073 . The chances of an ovule becoming a seed are greater the nearer it is to the stigmatic end, especially in small pods. Seedweight also increases towards the stigma, but this is not always the case.—G. F. S. E.

Silver-Leaf Disease. By F. T. Brooks, M.A. (*Jour. Agr. Sci.* v. pp. 288-308; June 1913; 2 plates).—The author records a large number of experiments with silver-leaf. The author regards the silvery appearance of diseased foliage as a symptom possibly produced

by different causes in different cases. The only cause known with certainty is the attack of the fungus *Stereum purpureum*. In other cases silvering of foliage may be the result of physiological disturbances unconnected with the action of any parasite, and the author quotes as instances the silvery appearance of certain plum seedlings, and of plants of the common white dead-nettle. He has been unable to confirm Percival's view that the silvering of the foliage is the result of the action of an oxidase, and supposes it to be due to interference with the transpiration current.

Not all trees attacked by *Stereum purpureum* develop the silvery appearance characteristic of the attack in 'Victoria' plums, for example. The author states that he has seen trees of apple and beech killed apparently by *Stereum purpureum*, but which had at no time shown any silver-leaf. At the same time cases are recorded, showing that the extent or intensity of silvering varies with different varieties of trees. Experiments show that *Stereum* from a birch is as effective in producing silvered plum leaves as is that taken from a plum.—*F. J. C.*

Shading, The Effects of Artificial, on Plant-growth in Louisiana.

By H. L. Shantz (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 279; April 1913, pp. 1-31; 6 plates, 11 figs.).—Experiments were devised to (1) show the effect of different degrees of shade, giving definite series of light intensities, on plant growth; (2) to show to what extent the shade effects were independent of other physical factors (*e.g.* temperature, humidity).

Six different plants—radish, lettuce, potato, cotton, maize, mustard—and six different intensities of light used. This was obtained by using a framework with cloths of different texture, so as to give five different degrees of shades (the sixth section was left uncovered and so received full light). The experiment continued for fifty-one days, the temperatures and humidity being recorded three times daily. The following is a general summary of the experiments:

1. When illumination decreases from $\frac{1}{2}$ normal to $\frac{1}{4}$ normal, a general increase in growth resulted in potato, cotton, lettuce, radish.
2. Corn made best growth in full light.
3. When light was reduced to $\frac{1}{8}$ normal or less, none of the plants were able to manufacture food material to produce growth.
4. When the solar energy was reduced to 10 calories per square metre per second, or less, photosynthesis and growth practically ceased.
5. Effects of variations in temperature and humidity were so slight that they could not be detected by comparison of control plants.—*A. B.*

Smoke and Gas Poisoning. By L. I. Knight and Wm. Crocker (*Bot. Gaz.* May 1913, pp. 337-371; 4 figs.).—The authors used etiolated epicotyls of pea seedlings, which are exceedingly sensitive to gaseous poisons, in all their experiments.

The response is not the same with all kinds of poison, but is manifested by either a decreased rate of elongation, or by swelling, or by diageotropism (sometimes by all three).

Tobacco smoke is very injurious to seedlings of some Leguminosae and Cucurbitaceae, also to many micro-organisms. It produces chemotactic movements of leaves in certain species of *Boehmeria* and *Splitgerbera*; in some species of *Boehmeria*, *Goldfussia*, *Salix*, *Sambucus*, and Potato sprouts diseased protuberances are formed. In twenty-four to forty-eight hours of tobacco smoke the leaves of *Mimosa pudica*, *Caragana*, *Robinia*, and *Halimodendron* fall off. Many Ferns and Liverworts were severely or slightly injured in the greenhouse in consequence of an attempt to destroy the insects by burning tobacco stems.

The authors suggest that this method should be summarily abolished. If the insecticide is nicotine, why not volatilize nicotine from an extract? If it is carbon monoxide, why not generate it chemically? (*Note by abstractor.*—This gas is excessively dangerous.) The heating furnace should not be in more or less open connexion with the greenhouses, for the extremely poisonous ethylene and dry distillation gases are liable to escape. In cigarette smoke of cellulose paper, carbon dioxide, carbon monoxide, acetylene, ethylene, methane, and some higher homologues of the last three gases are present. When the carbon dioxide is washed out, the smoke is still as poisonous as before. Carbon monoxide at .015 concentration produces the toxic effects observed. Ethylene is particularly injurious: 1 part in 10,000,000 stops elongation of the pea epicotyl, and 4 parts in 10,000,000 of atmosphere produces all the effects observed.

Neither hydrogen sulphide, ammonia, nicotine, hydrocyanic acid, nor pyridine, which are all present in tobacco smoke, produces the effect on the seedling observed when this substance is used. Methane is not certainly toxic. Acetylene and propylene are not important as poisonous constituents of it.

The etiolated epicotyl of the pea is extremely sensitive to poisonous gases; the open flower of Carnations is also exceedingly so. One part of ethylene in 2,000,000 of atmosphere puts the open flower to sleep in twelve hours.

Both as regards smoke and illuminating gas, it is the heavy hydrocarbons, especially ethylene, which are most dangerous. Injuries from coal smoke are usually ascribed to tars and oxides of sulphur, but small quantities of these heavy hydrocarbons exist in it, and though they cannot be detected by ordinary methods of gas analysis, they should not be neglected. Smoke from the beehive coke oven is probably especially dangerous.

Artificial illuminating gas often causes great loss, particularly during cold periods (through faulty mains), and especially injures shade trees.—G. F. S. E.

Soll Disease, Observations on a Peculiar. By W. E. Collinge (*Jour. Bd. Agr.* vol. xx. No. 10, pp 875-879).—The disease described is one which has troubled farmers in Warwickshire and

elsewhere. The plants affected were mainly agricultural crops, viz. wheat, oats, rye, and mangolds, but potatoes also suffered. The disease, which is known in some parts of Warwickshire as "Maysick," is characterized by the fact that in circular patches or in straggling lines the plants turn yellow in the leaf and almost cease to grow, and in consequence yield a poor crop or none at all.

The trouble is probably due to the inter-relation between the protozoa and bacteria of the soil.

A series of experiments was commenced in 1910 and continued during the two seasons following to investigate the action of (a) quicklime and (b) sulphur on "Maysick" soil. It was found that, whilst quicklime was of no value, sulphur prevented the disease. It would seem, however, that one may easily use too much sulphur. On a plot of wheat which had been dressed with 8 cwt. of sulphur per acre before sowing "many plants died, no doubt owing to the heavy dressing of sulphur." A dressing of 6 cwt. per acre is recommended.

The beneficial effects of sulphur were even more marked with potatoes than with cereals.—A. S.

Soils, Persistence of Bacteria in Old Dried. By L. T. Sharp (*Plant World*, vol. xvi., pp. 101-115).—It has been known for some time that the spore-forming bacteria, moulds, and yeasts, cyst-producing protozoa, and thick-walled cells in general show high resistant powers under different conditions of treatment. Soils exhibit an extreme complexity of chemical and physical conditions, and a great diversity in the number and species of their micro-flora, and therefore offer an unusually good field for the investigation of the resistance of organisms to desiccation, which is a subject of considerable practical importance, especially in the arid regions of the world. The significance of desiccation in general bacteriological practice is apparent in the preservation of various articles of food by drying, and in the transfer of dairy starters, yeasts, and cultures of *Bacillus radicola* on dried media, though the manufacturers guarantee the vitality of their dried cultures for only a few months. Previous observers have shown that while soils kept air-dry for two years contain only about one-fifth of the original number of bacteria, the rate of action (production of carbon dioxide, ammonia, &c.) on peptone and urea solutions was more rapid when the solutions were inoculated with soils previously air-dried than with moist soils, and Russell and Hutchinson suggest that the drying of the soil diminishes to a large extent the number of protozoa, which had been feeding on the bacteria, this elimination of competition enabling the bacterial processes to gain superiority when sterile solutions are inoculated with dry soil.

The author investigated air-dried soils which had been kept in tightly stoppered bottles for from twenty-five to thirty-three years, and made experiments to determine (1) the number of organisms present, (2) their physiological characters as manifested by their ammonification, nitrification, and nitrogen fixation powers. The soils

represented a variety of types, ranging from heavy clayey (adobe) soils to light sandy soils, from deep subsoils to surface soils, from soils rich in organic matter to poor sands, and from alkali soils to normal soils free from injurious amounts of injurious salts. He found that these soils still contained after thirty years a strong ammonifying power and a fair nitrogen fixation power, showing the remarkable persistence of the bacteria concerned in these processes; on the other hand, the nitrification bacteria were almost completely destroyed. The effects of drying upon the organisms in the soil are of great scientific and practical importance, as establishing the relative resistance and distinguishing features between groups of organisms concerned in the processes of ammonification, nitrification, and nitrogen fixation. It is also of interest that the soil organisms are able to live much longer in the soil itself than in other media—that is to say, the soil performs a protective function involving one or probably more factors. It is known that hygroscopic moisture has a protective function for plants by cooling the soil by evaporation, and it is very likely that the cooling influence produces a more favourable condition for the bacterial flora of soils, especially those exposed to direct rays of the summer sun in arid regions. The thickness of the film of hygroscopic moisture (calculated by A. D. Hall as 0.00001 of an inch) may in itself offer sufficient moisture for the maintenance of a portion of the soil flora, and the very minute size of the organisms may even permit of their complete protection in soils of high hygroscopic power. While hygroscopic moisture is a protective factor, gravitational and capillary water are rejuvenating forces. The results in this paper show that the bacterial activity may be renewed by the addition of sufficient moisture to dry soils. Thus in ammonification and nitrogen fixation though the original number of organisms is reduced, they become physiologically active when placed in solutions. Nitrification in most cases does not proceed, because the extreme drying period to which the soils had been subjected had entirely destroyed the nitrifying bacteria. The author emphasizes the fairly obvious conclusion that irrigation of arid soils must bring about rapid bacterial development in such soils by the striking effects of water on the bacterial flora.—F. C.

Soils Sterilized and Re-inoculated, Water-soluble Matter in. By T. L. Lyon and J. A. Bizzell (*U.S.A. Exp. Stn., Cornell, Bull.* 326; Jan. 1913; figs.).—A general outline of previous experiments is given, and the authors show that when steamed soils are inoculated with fresh soil, and with heated soil, there is a gradual decrease of water-soluble matter for several weeks, the decrease being more rapid for a time in that inoculated with fresh soil, and then slowing down, so that at the expiration of six months the sample inoculated with fresh soil contained the greater amount of soluble matter.

Analysis showed little difference in the amounts of available nutritive substances, and the authors consider the indications point to the production of some substance toxic to the plants. They also

consider the nature of the toxic substance produced on heating is governed to some extent by the condition of the organic matter before the heating is done.—*F. J. C.*

Soils, The Chemistry of Steam-heated. By O. Schreiner and E. C. Lathrop (*U.S.A. Dep. Agr., Bur. of Soils, Bull.* 89; Nov. 1912).—The authors find an increase of water-soluble substances during steam-heating, all the soluble substances isolated from unheated soils, except nucleic acid, being increased. Xanthine, hypoxanthine, guanine, cytosine, and arginine are all produced by heating soil, and are beneficial to plant growth; at the same time the harmful dihydroxystearic acid is increased when present in the unheated soil, and produced when not present. Whether the resulting soil after heating will produce good or bad crops the authors consider depends upon the relative proportions of these useful and harmful substances. This balance is influenced by cultural treatment, fertilizers, liming, crop growth, or crop rotation, &c., as well as by steam-heating.

F. J. C.

Sorghum, Feterita, a New Variety of. By H. N. Vinall and C. R. Ball (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 122; April 1913; pp. 25-32).—Feterita is a variety of sorghum introduced from the Sudan. It is a durra, related to white durra and to milo, with slender stems 4 to 7 feet high under varying conditions, erect heads, and large, rather soft, white grains. Experiments show it to be a good grain and foliage crop, about equal to milo in yield. It has acquired a name as a drought-resister, but it is stated that there is no satisfactory evidence that it is inherently more drought-resistant than other grain sorghums. Feterita is at present a variable plant, and seed selection and improvement will be necessary to obtain strains adapted to the districts in which it is grown.—*A. P.*

Sugar Beet Leaf-spot, The Control of the. By V. W. Pool and M. B. McKay (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 121; April 1913; pp. 13-17).—An account of the results thus far obtained from investigations now in progress. The leaf-spot is caused by a fungus, *Cercospora beticola* Sacc., which lives through the winter upon the old beet tops of the preceding season. It is thought that the organism is unable to survive a passage through the alimentary tract of cattle, sheep, and pigs, but as it is impossible to prevent waste in feeding the beet tops it is safer to make them into silage, the fungus being killed in the process.—*A. P.*

Sulphate of Ammonia, The Production of (*Jour. Bd. Agr.* vol. xx. No. 10, pp. 925-926).—The quantity of sulphate of ammonia produced in the United Kingdom in 1912 was 388,308 tons—an increase of 3,332 tons on the production of 1911.

The United Kingdom was formerly the most important sulphate

of ammonia producing country, but in recent years Germany has taken the first place.

Of the amount produced in 1912 in the United Kingdom, 287,000 tons were exported, so that the balance remaining for home consumption was approximately 90,000 tons. The exports of sulphate of ammonia are principally to the United States, Japan, Spain, Dutch East Indies, and Italy.—*A. S.*

Sulphur as a Dressing for Turnips and Beets. By M. A. Magnieu (*Jour. Soc. Nat. Hort. Fr.* Jan. 1913, pp. 54, 55).—M. Magnieu reports favourable results from two experiments in the use of sulphur as a dressing, one for turnips and one for beetroot. In the former case the sulphur was sown broadcast at the rate of 2 grammes of flour of sulphur to the square mètre. In the latter experiment the sulphur was not weighed, but it may be put down as about 2 or 3 grammes to the mètre along the drills.—*M. L. H.*

Sweet Potato, The Black-rot and Stem-rot of the. By L. L. Harter (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 114; Feb. 1913; pp. 15-18).—This paper outlines what are believed to be the most effective means of controlling these diseases, though some of the recommendations are tentative only and may require modification upon the completion of experiments which are now in progress.—*A. P.*

Thlaspi, Pollination of. By Rob. Stäger (*Beih. Bot. Cent.* xxx. Abt. 1, Heft 1, pp. 17-23).—The flowers of *Thlaspi rotundifolium* have been described as capable or as incapable of self-pollination and as both dichogamous and monogamous. All these various methods occur according to conditions of weather and of altitude. In the Tyrol, anthers and stigma ripen together, but there is no self-pollination. At 500 mètres and 2200 mètres (Zürich and Jorat) the flowers are protogynous and not self-pollinated; but at Susanze (2200 m.) self-pollination occurs at close of flowering. At very high altitudes, 2600 mètres and over, the flowers remain protogynous, but self-pollination is more distinct; yet even at Rohrbachstein (2900 m.) cross-pollination occurs.

The growth of the style and turning back of the stamens prevent self-pollination even at 2200 m. in sunny situations; but this does not happen at higher altitudes, even on very warm days, for the nights are very cold.—*G. F. S. E.*

Thorn, a twice-flowering Variety. By G. Gibault (*Rev. Hort.* p. 26, Jan. 16, 1914).—A description of a tree which, on the lines of the Glastonbury Thorn and a similar example described by Prof. C. Avelon in the previous number, flowered persistently at Christmas, as well as at the normal time, all three being traditionally imputed to saintly influence. None of these apparently could be propagated so as to reproduce their peculiarity.—*C. T. D.*

Thorn Formation, Cause of. By A. Lothelier (*Rev. gén. de Bot.* t. 24, pp. 297-7).—Since the earlier work of Lothelier (1893) on the production of thorns in plants, it has been generally believed that the development of these structures is favoured, or even caused, by atmospheric desiccation or by intense light, or both factors acting together. Lothelier found that in the common gorse (*Ulex europaeus*) the branches of the second order, which normally end in a sharp spine, grew out to form leafy shoots when caused to grow in humid air or in feeble light; he obtained similar results with *Berberis*, *Crataegus*, and other spiny plants. Cockayne (1905) obtained similar results with *Discaria Toumatou*, a New Zealand Rhamnaceous plant; spines were not developed in moist air and feeble light, their place being taken by leafy shoots of unlimited growth. Zeidler (1911) found that thorns were developed in *Ulex* plants kept in partial darkness or in moist air, and he regarded the leafy shoots obtained by Lothelier under similar conditions as being merely juvenile forms, the thorny shoots being adult forms. However, even if these results of Zeidler's be accurate and we accept his view instead of Lothelier's, it is obvious that it still remains to be determined why "juvenile shoots" should appear at some times and "adult shoots" at others. Lothelier now replies to Zeidler's criticism, and states that if the leafy shoots are produced only in moist air the latter must surely be considered as the cause of their production; hence, if Zeidler's view is correct, the leafy "juvenile" form ought to become spiny towards the growing end, whereas as a matter of fact this transformation does not take place in moist air. He therefore maintains his former view that atmospheric humidity is the direct cause of the inhibition of spine development in a normally spiny plant like *Ulex*, and conversely that the production of spines is the direct result of desiccation and strong illumination. It is clear that further investigation is necessary for a solution of what appears at first sight a simple matter, but which in reality is very complex.—*F. C.*

Tomato, Black Spot. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxv. pt. i. p. 26).—Some varieties of Tomato are more free from black spot than others. Spray the plants with Bordeaux mixture as soon as the blossoms fall. Irregular watering, too much exposure to the sun, and too much nitrate of soda predispose the plants to attack by Black Spot.—*S. E. W.*

Transpiration of Infected Apple Leaves. By H. S. Reed and J. S. Cooley (*Bot. Gaz.* June 1913, pp. 421-430; 1 fig.).—The authors give tables of observations of the transpiration of apple leaves infected with *Gymnosporangium*. The shoots with a few apple leaves were enclosed in a glass cylinder and the exhaled water absorbed with calcium chloride. The experiments lasted from July 9 and 11 to August 20 and 23. They found that the transpiration of diseased leaves was almost always less than that of healthy ones. Yet at

the beginning of the experiment there were days in which the diseased leaves transpired half as much again as the healthy specimens. They ascribe this lower transpiration to hypertrophy, closure of inter-cellular spaces, and absence of stomata.—*G. F. S. E.*

Tree Crickets, Notes on. By P. J. Parrott and B. B. Fulton (*Jour. Econ. Entom.* vi. pp. 177-180; April 1913; figs.).—The tree crickets *Oecanthus niveus*, *O. nigricornis*, and *O. quadri-punctatus*, all of which lay their eggs in the bark of trees and other plants, are briefly dealt with, the mode of egg-arrangement and the kinds of plants affected being the main features of the article. The infection of the trees by fungi through the wounds made is also referred to.
F. J. C.

Trees and Shrubs in Ireland. By W. J. Bean (*Bull. Roy. Bot. Gard. Kew*, 1913, No. 3, pp. 106-113).—An account of the noteworthy trees and shrubs growing in certain well-known gardens in Ireland.—*A. S.*

Trifolium pratense, Pollen of. By J. N. Martin (*Bot. Gaz.* Aug. 1913, pp. 112-126; one fig.).—This paper gives in full a series of careful experiments on the germination of red clover pollen.

A whole series of sugars of different concentration were tried without any satisfactory result, but when the pollen was placed on moist animal membrane under bell-jars, good germination was obtained in 8-10 minutes. The author concludes that germination is delicately adjusted to the amount of water available. This amount varies within very narrow limits: sugar solution and the secretion of the stigma only affect germination by their influence on the water-supply. Pollen, in self-pollination, germinates readily, but the tubes traverse the style much more slowly than in cross-pollination.—*G. F. S. E.*

Vegetable Gardening in Algerian Oases. By Lieut. Nicloux and Mar. des Logis Arzillos (*Rev. Hort. de l'Alg.* Feb. 1913, p. 37; March, p. 85; and April, p. 125; figs.).—Three articles containing an account of vegetable growing in an Algerian oasis. The first starts with hints on the choice of the exact site for the garden in cases where choice is still possible, and other points treated of are: hedges and wind screens, extent of the garden in proportion to available labour, the summer garden and the winter garden, analysis of soils, preparation of the soil, levelling and the construction of internal walls, garden planning, the choice of suitable tools. A list is given of all the fruits and vegetables which can be grown in such a garden, with a description of the treatment required by each.—*M. L. H.*

Vegetation above the Snow-line in the Alps. By J. Braun (*Ber. d. naturforsch. Schweiz.*, 1913, 347 pp.).—The author gives an interesting account of the nival (above snow-line) flora of the great

mountain masses of south-eastern Switzerland, including the Lepontine Alps in the west and the Rhaetian Alps in the east. His chief object is to present "a picture of plant life at its extreme limit," and though nearly half of his work, which has also been published in book form,* is occupied by lists of species with their habitats, he has throughout dealt with their nival zone from an ecological rather than a floristic standpoint. The climatic snow-line, forming the lower limit of the nival zone, lies at about 2650 mètres in the western (Sardona and Gotthard) region and at about 2960 m. in the eastern (Bernina) region, and the flora of the nival zone in the area investigated includes 224 vascular plants. The author divides the plant associations into three main sub-zones—(1) a lower, up to 150 m. above the snow-line, dominated by grasses; (2) a middle, up to 550 m. above snow-line, characterized by Dicotyledons; and (3) a summit flora devoid of flowering plants and consisting only of Thallophyta (Algae, Fungi, Lichens) which extend up to the highest peaks. Wind is one of the most important factors in the environment of the nival flora, and the author devotes an interesting chapter to the effects on the nival vegetation of the strong winds that prevail in the high Alps, especially in winter. The drying action of these winds excludes all except a few hardy species (*Saxifraga retusa*, *S. caesia*, *Androsace helvetica*, *Gentiana brachyphylla*, &c.) from the snow-free but exposed places. The low-growing tufted, patch-forming, and cushion plants are furrowed, undermined, and distorted by the mechanical action of the wind and the fine snow which it sweeps over the plants as a "snow-blast" comparable with the fierce sand-blast in deserts.

Other interesting sections are that dealing with the ripening, viability, and dispersal of the seeds of nival plants. The author finds that the conditions above snow-line are not so unfavourable for the ripening of seed as has usually been supposed, for in 25 species collected above 3100 m. the seeds were fully ripe and capable of germination, and he believes that the nival flora does not depend to any great extent upon the carriage of seeds from lower levels for its maintenance. Many of his observations are of considerable practical interest to those concerned with the collection and cultivation of alpine plants, though of course the great majority of the nival species also occur at lower elevations. In more than 20 per cent. of the nival species the fruits with their seeds remain on the plant over the winter, and in some cases for two or three winters, and the seeds in such cases show a higher germination capacity than seeds collected in the autumn after flowering. Shrubs like *Empetrum*, *Vaccinium*, and *Juniperus* occur here and there in the nival zone, arising from seeds carried by birds, but they are usually dwarfed plants and are always sterile. From various facts and considerations which he brings forward, the author concludes that in the Glacial Period a relatively rich flora, similar to the nival flora of the present day, persisted in the interior of the Alps; for

* *Vegetationsverhältnisse der Schneestufe in den Rätisch-Lepontischen Alpen*, Georg & Co., Bâle, price 20 marks.

instance, there are certain nival species which have no special method of dispersal and which show markedly discontinuous distribution, and these can hardly be regarded otherwise than as relict forms.—F. C.

Vegetable Crops, Diseases of. By F. D. Bailey (*U.S.A. Exp. Stn. Oregon, Report, 1911-12*, pp. 270-291; figs.).—The following diseases are dealt with: Black-leg of cabbage and cauliflower, characterized by the blackening and decay of the stem close to the surface of the ground, due to *Phoma oleracea*. Club root of various cruciferous plants, due to *Plasmodiophora brassicae*, not very common in Oregon, and to be controlled by liming the soil. Celery blight, caused by *Septoria petroselinii* var. *apii*, already described in this JOURNAL. Downy mildew of lettuce, caused by *Bremia lactucae*, drop disease of the same plant, due to *Sclerotinia Libertiana*, gray mould caused by *Botrytis cinerea*, damping off, brought about by *Corticium vagum*, leaf perforation due to *Marssonina perforans*, onion mildew, potato disease (*Phytophthora infestans*), potato dry rot (*Fusarium oxysporum*), to which wilt is also attributed, "little potatoes" following the attack of *Rhizoctonia solani*, black-leg due to *Bacillus phytophthorus* and *B. solanisaprus*, scab due to *Oospora scabies*, are all dealt with and methods of control suggested. Of tomato diseases, wilt (of two kinds), blight due to *Phytophthora*, leaf mould caused by *Cladosporium fulvum*, and blossom-end rot are described. Water-melon wilt due to a species of *Fusarium* is also dealt with.—F. J. C.

Vine Budding. By J. B. Mais (*Rev. Hort. de l'Alg.* March 1913, p. 120; figs.).—A speedy and satisfactory method of renewing a vineyard is said to be by budding wild stocks, the stocks to be planted in prepared ground from December to March, and the budding to be performed successively from early summer till September 10. After that date the possibility of cold rain makes success uncertain. The vigour of plantations made in this way is much greater for the first five years. After that time the difference is less noticeable.—M. L. H.

Vine Pruning in California (Part I.). By F. T. Bioletti (*U.S.A. Exp. Stn., California, Bull.* 241, 47 pp.; 20 figs.).—With a few unimportant exceptions, all the vines grown for their fruit in California are varieties of *Vitis vinifera*, but they are different for the most part from those grown elsewhere in America. This and the differences of climate have led to the adoption of a system of pruning in some respects peculiar to this State.—A. P.

Viola × floralrensis. By H. Correvon (*Garden*, June 4, 1913, p. 11).—A hybrid between *V. rothomagensis* and *V. calcarata*, found in the garden at Floraire, near Geneva, six years ago. A very low creeping plant, like *V. saxatilis*, but the flowers, instead of dark purple, are pale lilac, with light blue centre, marked with fifteen or seventeen dark stripes and a golden eye. It flowers through the whole year and sows itself everywhere when established.—H. R. D.

Violet, The Diseases of the. By D. Reddick (*U.S.A. Hort. Soc. Mass. Trans.* 1913, pp. 85-102; plates).—After a note on the cultivation of the violet and a comparison of the conditions of cultivation with those occurring in the wild habitats of the plant, the author deals with the various diseases which attack it. Root rot caused by *Thielavia basicola*, a fungus which occurs on a variety of hosts (see *JOURNAL R.H.S.* xxxvii. p. 547).—The symptoms of this disease are a yellowish appearance, with some dwarfing and crinkling of the foliage; the underground stem is cracked and rough, or in damp places appears water-soaked and black in spots. Black or brown areas encircling the roots also occur. On the young runners and leaf petioles water-soaked spots with a whitish centre and a black margin are produced. The author supports Chittenden's suggestion that the amount of water in the soil is an active factor in the production of the disease, but he does not find that the use of acid phosphate is at all an effective check. Sterilizing the soil with formalin, used at the rate of 1 pint to 12½ gallons, seems to be much more effective. Crown rot disease is brought about by the fungus *Sclerotinia*. For this disease thorough control of the drainage and removal of affected plants, with the subsequent dusting of the soil with air-slaked lime, are considered to be effective measures of control. Leaf-spot diseases, due principally to *Alternaria violae* and *Phyllosticta violae*, rarely yield to spraying, and it is thought that the brushing of plants with a stick and prompt removal of spotted leaves are the best methods of dealing with the pest.—F. J. C.

Vitis Thunbergii (*Bot. Mag.*, tab. 8558).—China and Japan, *Nat. Ord.* Ampelidaceae, *Tribe* Vitoideae. Shrub climbing; leaves 4-6 inches across. Flowers small, green. Berry ovoid, purplish-black.
G. H.

Wall-Gardening. By Henri Correvon (*Rev. de l'Hort. Belg.* Feb. 28, 1913; p. 63).—An article on dry wall-planting by the well-known enthusiast, M. H. Correvon.—M. L. H.

Wheat, Wild, in Palestine. By O. F. Cook (*U.S.A. Dep. Agr., Bull.* 274, 1913, 56 pp.; 11 figs., 15 plates).—Wild wheat is widely distributed on limestone formations in Palestine, extending from the higher slopes of Mount Hermon to the Dead Sea valley. It resembles, but is distinct from, *Triticum dicoccum* and *T. monococcum*. It may be suitable for cultivation in the arid districts of the South-western States or valuable for hybridizing.—S. E. W.

Wistarias and how to Grow them. By W. D. (*Garden*, July 5, 1913, p. 339).—The species of *Wistaria*, though few in number, may be put to many uses, owing to their response to severe pruning. They have recently been extensively used for forcing, and may be grown in the same pot for a number of years. They may be used

with effect as lawn plants or planted against walls. Pruning may be carried out in July and again in September.

Wistaria chinensis, the commonest, is a native of China, brought to England in May 1816 by Capt. R. Welbank. The white variety is also excellent, but the double less desirable.

W. multijuga, also from China, has been long grown by Japanese gardeners. It differs from *chinensis* in the inflorescence being much longer, from 2 to 4 feet in length. There are purplish and white forms.

W. frutescens is from the United States; the leaves are upwards of 9 inches long, and the racemes of lilac-purple flowers 4 to 8 inches in length; it was introduced about 1724, and blooms later than the Chinese varieties. There are a double white, a pale lilac, and purplish forms.

W. brachybotrys, a native of Japan, is a weaker grower than the others. The bluish or mauve flowers are borne in rather dense racemes later than the other species. White and rose-coloured varieties may be obtained.—H. R. D.

Wood-oil Tree, Chinese. By D. Fairchild (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 108; April 1913; figs.).—*Aleurites Fordii* produces fruit when four or five years of age. Its seed contains one of the best drying oils known. It is a native of China, in heavy clay lands along the Yangtze river above Hankow, and has proved hardy in the Southern States. It is deciduous, and late in opening its leaves, but flowers in March (the flowers are said to be less liable to frost injury than are those of pear and peach). The wood is soft and of little value, but the growing use of soy-bean oil will increase the demand for wood oil, as the former dries too slowly. Five million gallons (requiring about 40,000 acres to supply the demand) are now imported into America from China.—F. J. C.

Woody Aster. By S. K. Loy (*U.S.A. Exp. Stn., Wyoming, Ann. Rep.*, 1912-13, p. 65).—It has been demonstrated practically beyond a doubt that two glucosides are present in the plant, as well as some other compound which yields a pyridine base when treated in an acid solution with a base until it becomes neutral or alkaline. Further investigations are in progress.—A. P.

Woody Plants of Kentucky. By H. Garman (*U.S.A. Exp. Stn. Kentucky, Bull.* 169, pp. 62; 20 plates).—A list of 259 woody plants found in Kentucky.—S. E. W.

Woolly Aphs. By E. M. Patch (*Jour. Econ. Entom.* vi. p. 316; figs.).—It is suggested that one of the leaf-curling aphides of the elm is *Schizoneura lanigera* (the woolly aphis), which it is thought probably migrates from the apple. The other is *S. ulmi*.—F. J. C.

Zephyranthes cardinalis (*Bot. Mag.*, tab. 8553).—America. *Nat. Ord.* Amaryllidaceae, *Tribe* Amarylleae. Leaves ligulate, acuminate, $5\frac{1}{2}$ inches long. Scape $4\frac{1}{2}$ inches long. Spathe rose-pink. Perianth bright red, 3 inches across, expanded.—*G. H.*

Zinc Arsenite and Arseniate of Lead, Comparative Tests with. By W. J. Schoene (*Jour. Econ. Entom.* vi. pp. 157-159; April 1913).—The author found zinc arsenite (1 lb. to 50 gallons of water) somewhat quicker in poisoning caterpillars than lead arseniate (3 lb. to 50 gallons), especially when the caterpillars were on the foliage when the spray was applied. The tests were made on a variety of pests and plants, and with and without Bordeaux mixture, lime, lime-sulphur, &c. The two substances were about equally adhesive to the foliage. In combination with other substances both proved somewhat repellent for a time; afterwards they were eaten, but only when they had lost some of their effectiveness. The foliage of apples was uninjured by zinc arsenite when it was mixed with lime or Bordeaux mixture, but slight burning occurred at the leaf margins when lime-sulphur was used with it, and rather more with other things and by the zinc salt alone. This burning was also evident where the epidermis had been damaged.—*F. J. C.*

Zinc Arsenite as an Insecticide. By W. J. Schoene (*Agr. Exp. Stn., New York, Bull.* 28; March 1913; 3 tabs.).—An investigation of the comparison in efficiency and safety of zinc arsenite and lead arsenate. Smaller quantities of the zinc salt were found to be effective as insect poisons, but against this was its liability to cause more or less serious injury. In experiments upon grapes, where both fruit and foliage suffered severe burning, the injury was not apparent for a period varying from one to three weeks.—*W. A. V.*

Zygadenus intermedius, Some Constituents of the Leaves of. By F. W. Heyl and F. E. Hepner (*U.S.A. Exp. Stn., Wyoming, Ann. Rep.*, 1912-13, pp. 80-91).—Following the isolation of a characteristic alkaloid, "zygadenine," the ascription of poisonous properties to the resin of a similar species (*Zygadenus venenosus*) has led the authors to extend the chemical examination of the plant to other constituents. They have been unable to isolate any toxic substances from the resin, and their conclusions concerning the resin have been confirmed by a series of physiological tests upon dogs, in which the resin administered by mouth proved to be physiologically inert.—*A. P.*

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PART II.

ON CERTAIN RELATIONS BETWEEN THE PLANT AND ITS PHYSICAL ENVIRONMENT.

By Prof. J. B. FARMER, M.A., D.Sc., F.R.S.

[Read June 16, 1914; Dr. D. H. SCOTT in the Chair.]

Being the Eleventh "Masters Lecture."

EVERYONE who has had to do with the raising and growing of plants is aware how readily many of them change their habit and structure in relation to the kind of environment in which they grow. Conditions of moisture, temperature, quality of soil, and a host of other physical conditions all take their share in determining the final result. Besides these things, there are other complex factors, such as the influence of, and interaction between, one plant and another in the competition for food, light, soil constituents, together with many other and more obscure relationships which ought not to be ignored in any endeavour to penetrate the veil which conceals so many of the secrets of vegetative growth, and hides from our ken so much that at first sight appears as purely purposeful adaptation to this or that set of external conditions.

It seems to me, then, that the traditions of the Masters lectures will not be greatly violated by an attempt, which must of necessity be but an imperfect one, to indicate a few of the problems of plant life, some of which are not only of interest or importance to horticulturists, but are those on which horticulturists are perhaps better qualified than most people to provide the clues needed to direct investigations into profitable channels. I well recollect a conversation many years ago with Dr. MASTERS himself, in which he advocated this point of view.

I propose then to-day to confine my remarks to a consideration of the plant in relation to its physical environment, reserving for the next lecture that of the mutual influences of the plants themselves one upon another.

If we ask ourselves what are the most fundamental of the physical conditions which on the whole affect plant growth, we should not be far wrong in naming temperature and the available water supply as of prime importance. Temperature cannot be ignored, for it affects the nature and rate of chemical change. This is easily seen, in its broader outlines, when one compares the behaviour of temperate and stove-plants with each other. The influence of water supply on vegetation in its more superficial aspects is familiar to everybody, but as soon as one gets nearer to the life processes themselves one becomes aware how profoundly the water content may determine the course of development of an organism. For the plant is a chemical laboratory, in which delicate operations of manifold variety are going on, all regulated by an apparatus which itself is readily liable to change under the influence of altering physical conditions. Amid such complexity it is hardly surprising that we have as yet made but little headway, comparatively speaking, in obtaining comprehension of what goes on in a plant; but we have, nevertheless, made some sure advance, and here and there we have begun to piece together parts of the whole story. The further we proceed the more clearly do we see that success or failure is bound up with providing the conditions requisite for the proper carrying out of those chemical changes that lie behind healthy life, and that, as we are able to replace empirical treatment by a procedure based on a true appreciation of the really relevant facts, our advance will be the more certain and the more rapid.

As our knowledge grows, we find that the gulf which still separates the living from the non-living world is not so formidably wide as it once seemed to be. By refusing to rest contented with seeing in a particular "adaptation" just a beautiful adjustment of plant structure to its supposed requirements—by substituting for this pleasant fashion of regarding the development of useful variations a more prosaic and more rigorous analysis of the factors concerned—we acquire a new standpoint, and one which is full of promise. The further our understanding can probe the matter, and disentangle the causes and effects, the more certainly shall we get intelligent control over plant growth, and be able to secure with certainty results that we now can only occasionally obtain by chance.

Chemistry and physics have taught us much, and they have enabled us not only to win a great measure of control over the inorganic world but also to make some inroads into the organic one, and the further we advance on those lines the more surely we find matters that seemed mysterious are susceptible of resolution into simpler components which fit into the scheme of things, so far as they have as yet become understood.

It has long been known that chemical reactions are profoundly

influenced by the conditions of temperature, that they only proceed at all between certain limits, but that within these limits the rate is largely a function of the temperature. As the limits, however, are approached, other factors become operative and arrest or even reverse the reaction. A recognition of these facts enables us to appreciate at once the vital importance of temperature in connexion with the chemical changes that go on within a plant, and especially those which are concerned with the elaboration or utilization of food substances. This is equally true whether we are thinking of the complicated chemical compounds which are built up within the plant from the simpler bodies that are absorbed as food materials from the soil and the air, or whether we are considering the processes by which the food reserves of a seed begin to undergo those changes necessary to enable germination to begin and to be carried to a successful issue. In these and all similar cases we are dealing with *chemical transformations*, and the chemical transformations are dependent (*inter alia*) on *appropriate* temperature conditions, though it is seldom, or perhaps never, that temperature alone is concerned. But at any rate, in order to ensure suitable development, this factor must really be properly adjusted, otherwise what we call diseased or abnormal conditions of growth supervene—if, indeed, any development takes place at all.

But the influence of temperature does not stop short at permitting various chemical changes in the not-living organic contents to go on with greater or less rapidity, and subject to definite laws. I have said the plant may be likened to a laboratory; it is very well stocked with delicate apparatus, and this apparatus, which as a whole constitutes what we call the living stuff, provides the means for the carrying on of the processes which I have just indicated under the general name of chemical change. The apparatus itself—the framework or matrix in which these changes are proceeding—is of a complexity at present immeasurable. It is also, as I have said, itself affected by the conditions, or at any rate by some of them, which build up or break down the relatively simple substances within it. We are not dealing with a simple machine like a steam engine, in which the coal, water, &c., merely provide the energy for causing the mechanism to work. Vital mechanism is a vastly more complex thing. For it is itself subject to change, and any alteration in its own conformation will produce effects as yet for the most part incalculable in the final result. We can visualize, in a simple instance, how an alteration in the end products may be brought about by a slight modification of the mechanism if we remember the way in which an ordinary pendulum clock becomes fast or slow as the temperature falls or rises. But vital mechanism is more complicated than this.

Let us consider, as an example taken from plants, the problem of root pressure, or bleeding. Every gardener knows that if a vine or other plant is cut in the early spring it is apt to continue to discharge a watery sap from the cut surface. This is water which has been forced into the stem by the roots, which in their turn have absorbed

it from the soil. The cells of the root somehow force it up the wood conduits to such an extent that it may balance the pressure of several atmospheres. Now, of course, it is very convenient that such an arrangement should exist, for it enables the water to be pumped up the trunks of trees in the spring. But that is no explanation whatever of its occurrence, nor indeed are we able as yet to give a completely intelligible physical explanation of how it comes about. Various so-called explanations of course have been suggested, but none has been able to stand the test of physical and mathematical investigation. But if we cannot solve the whole problem, we can follow up some parts of it, and as this question of water supply is of paramount interest to all who cultivate plants, I may perhaps be forgiven for dwelling more at length upon it, especially as much misapprehension exists on the subject. I may assume that the ordinary structure of a typical root is understood, and the annexed figure (Fig. 43) will serve to recall its appearance in transverse section.

What occurs is that the root hairs absorb the water from the soil, and this water passes through the intervening cells till it reaches those which abut directly on the wood. From them it is forced into the conduits of the wood as already stated. How this wonderful thing is brought about we do not really know, nor is it easy directly to investigate it. We think we understand pretty well how the water is extracted from the soil; what we do not know is how it is continually forced out at the other end. To put it in more exact words, we do not know for certain the source of the energy which maintains the forcible flow, nor do we know at all how the energy itself is utilized in the process—a very unsatisfactory state of things, but a knowledge of exactly what it is that we wish to ascertain is the first step in any investigation. I hope, at any rate, I have made clear the difference between understanding a phenomenon and the mere recognition of its utility.

But there is one fact in root structure which I think is worth noting in connexion with root pressure, and this relates to the structure of the endodermis. The endodermis forms a continuous sheet of jacket cells which completely cuts off all direct communication between the vascular cylinder on its inside and the rind with its air spaces on the outside. Certain cells of the endodermis are definitely the tracks through which the water passes inwards, the others are often strengthened in various ways. The evidence appears irresistible, on closer examination, that the presence of this layer in the roots—it is *always* present in roots, whilst in the stem it may or may not be recognizable—is intimately bound up with the process of water movement. At any rate, not to go more deeply into the matter, it constitutes a beautifully constructed arrangement for preventing water that has once passed through it from leaking outwards except by passing through the interior of the cells themselves—and thus it is pretty certainly intimately connected at any rate with the maintenance of root pressure.

Now I have said that the physical basis of life, the protoplasm,

is responsible for providing the mechanism whereby root pressure is set up. Anything that affects the protoplasmic mechanism will affect this water mechanism. Extremes of temperature, either heat or cold, will abolish it; though, if the prejudicial effect has not been carried on too far, recovery may ensue on a return to appropriate temperatures. Anæsthetics and other poisons will also destroy it. And we know something of the way in which these things work. Normal protoplasm is a jelly-like substance, and possesses the properties of what physical chemists call colloids—that is, glue- or gum-like substances. This means that the particles of which it is made up are in a special state of aggregation. The molecules are large, and the interspaces between them are occupied by water held there in a peculiar condition and subject to certain laws which are now gradually being discovered. This physical condition of water + the molecules, forming the jelly-like colloid, is, by virtue of its texture and composition, the seat of peculiar forces which are only active so long as the particular state of aggregation is maintained. Anything that modifies this state immediately affects the nature and play of the forces within it, and causes substances which can react with one another to meet under different conditions. The results of such reaction are thus seen to be different according to the manner in which the particles of the viscous stuff are associated with each other. And without going more fully into the matter we may say that one of the predominating causes of the variety of chemical activities within the protoplasm depends largely on the state of aggregation of the protoplasm itself, and the amount of water present is one of the factors that affects this condition of aggregation.

Many of the reactions are associated with so-called ferment actions. Now no one has ever prepared a pure ferment, so we do not know what any one of these numerous substances may really be like. It is even possible that a large number of them may turn out not to be separate substances at all in the ordinary meaning of the term, but that they represent alternative structural conformations of certain of the materials of which the cell stuff is composed. Their action is usually simple, and often consists in merely incorporating or withdrawing the elements of water in or from the fermentable substance. It is true they are not all so simple, for others, and very important ones, are concerned with promoting oxidation or some analogous change in the substances on which they can operate. But the simpler ferments—and they are the most numerous—only act as hasteners of reactions which can be produced more slowly in a variety of ways. Moreover, and this is of fundamental importance, they are not themselves consumed in the process. It appears then that their rôle is a passive rather than an active one. They provide the form of introduction to each other of the reacting bodies, *e.g.* water and the fermentable material, and the result depends on the way these reacting bodies are presented, and the conditions under which the introduction is made.

Seeing, then, that water so profoundly affects protoplasmic activity, it behoves us to endeavour to get to know as much as we can of the conditions under which the plants extract it from the soil in which they live.

Everyone knows how different are the root systems of different plants, and there is a rough correlation between the root system and the kind of soil in which a plant can thrive. The Rose, with its small roots, marsh plants with their feebly developed root branches, are obviously not fitted for light dry soils, whilst the enormously developed roots of many plants of the desert and other analogous situations (from a physiological point of view) further confirm the inference that there exists a real relation between root and soil structure. The matter is, however, complicated by other considerations which often mask these relations, as, for example, when the output of water is lowered in consequence of special structural character in the aerial part of the plant, *e.g.* reduction of leaf surface, &c. Such plants can thrive with relatively small root systems, whilst others which have to extract much inorganic food from a sandy soil obviously can only colonize such situations if they can produce roots which can penetrate the substratum deeply and widely.

Individual species differ greatly in their tolerance of intermittent periods of dry conditions, and this is one of the practical difficulties the gardener has to contend with in trying to grow all sorts of physiologically different plants in a somewhat similar environment. In nature it is otherwise, and this water factor is one of the predominating influences which is effective in producing that well-marked facies of certain types of vegetation which it is the fashion nowadays to call a plant association. A knowledge of the water requirement is one of the elements of successful cultivation, and I will illustrate this by reference to two plants whose behaviour in this connexion I have especially studied.

Lilium Martagon var. *album* is a plant many people find difficult to grow well; hence, presumably, its high price. But by attending to its water requirements it is a far easier and more certain plant than *L. candidum* and many other "easy" lilies. If one is acquainted with *L. Martagon* in its natural home, say in the Alps, where it is very common, one finds it inhabiting rather dry copses, but with water not very far from the surface. That is to say, the bulb is dry, the rather long roots are bathed in moisture. The common Martagon seems to be not very particular, but the white variety is far more sensitive, at least it is so with me, and I have grown it under very different conditions and on very different soils. The one thing that matters is the distribution of water in the soil, and if this need is satisfied success will certainly follow.

Another plant is *Morisia hypogaea*, a Mediterranean cruciferous plant, found especially in Corsica. This species will grow in many situations, but I have only found one type of habitat where it will thrive, and form big hardy plants that flower from December to June,

and where it produces seedlings in such quantity that they become a veritable nuisance. This is in a deep scree-slope—the structure that is often called a moraine by gardeners. This scree-slope was formed by filling in a cutting into gravel over clay, some 4 feet deep, with stones, granite chips, peat and soil. The seedlings, as soon as they start growing, send down long tap-roots, which, so far as I can judge, reach to somewhere near the bottom of the cutting. Natural water flows perennially at the junction of the gravel and clay, and the plants, thus provided for, never show any signs of wilting, nor are they ever watered during periods of dry weather. Of course it is possible to grow *Morisia* under conditions very different from these, but in such places I have never seen it flourish as it does in the spot I have described, where the plants are hard and stocky, with no sign of the lush weediness that one often sees in this beautiful species. Other examples that might be quoted in support of the power of colonizing particular localities are the Spruce, Fir, and Scots Pine, where an examination of their respective root systems at once gives the clue to the diverse habitats wherein they severally thrive.

The importance of attention to the relation of the plant to water is seen in yet other connexions.

One of the important results of grafting of fruit trees, &c., depends on the interference with the normal water supply. Whilst grafting renders *propagation* easy, it has other consequences also. Every fruit-grower is aware of the importance of the *stock*, and he is also probably aware of the effect of the influences making for deep coarse rooting of apple and other fruit trees. Still it is amazing how much ignorance still prevails. The formation of the dwarf spurs on which in most apple and pear trees the fruit is chiefly or entirely borne results, in a sense, from a reaction on the part of the plant to lack of water. But the internal balance of water supply is a nicely adjusted one, as is occasionally shown by the consequences of damage through accident or ignorance to the leading shoots, resulting in potential spurs growing on as wood buds when the leader, which, so to say, draws the water past them, is cut back. Similar or analogous results of water starvation are of course produced as the effects of root pruning, especially on plants that have been over-luxuriant. On weaker plants root pruning, as is well known, may either have no effect or else a prejudicial one. [The production of characteristically large leaves on the stool shoots of trees further illustrates the points under discussion.]

Now the matter is not a simple question of the regulation of water supply, for any interference with this important factor of plant growth and development necessarily brings about a change in other conditions within the plant. In the first place, along with the water, the nutritious salts from the soil gain admission to the plant. No one knows better than a gardener the effects of adding manures of various sorts to the soil, so far as the obvious consequences to the plant are concerned. But the horticulturist, like most other people, has the slightest of knowledge as to what *happens* in the plant as the result of the addition

of manures. In a general way we know that nitrogenous manure tends to produce luxuriant vegetative growth, and that if applied in excess it will encourage the development of qualities that may cause many kinds of plants to fall an easy prey to the onset of disease. Other manures, *e.g.* potash and phosphatic, may, but do not always, encourage a storage of food reserves, and so indirectly bring about fruitfulness and early maturity of the crop. It is unwise, if indeed it is not impracticable, to generalize very widely on the effect of this or that manure. Not only has its influence on the soil tilth, and its effects on the other soil constituents, to be taken into account—and at present we do not know enough about this—but there is also the chemical idiosyncrasy of the plant to be reckoned with. By the chemical idiosyncrasy I mean that which is often described as its specific nature. But I prefer the former term, inasmuch as I believe it to express more precisely what it is that we are really concerned with in distinguishing one plant or group of plants from another. All the evidence at our command which is worth anything points to the conclusion that the essential features in which one species differs from another are just in chemical properties, and that it is this immensely important fact that lies behind, and is responsible for, the existence of those outward characters to which we naturally have recourse in distinguishing varieties, species, or genera of plants. I need do no more in this connexion than remind you how often nearly related plants are characterized by the common production of identical or at least of nearly related chemical compounds.

But in considering the plant from the point of view of water supply in connexion with its environment, the physical structure and properties of soils must not be lost sight of. The work of recent years has very clearly shown that the percentage content of water in a given weight of soil may afford very misleading data as to its suitability for supporting vegetation. In other words, the water is held in very different degrees of fastness by soils of different character. A soil, if it be of a clay or peaty nature and containing, say, 30 per cent. of water, may be far less "wet" from the plant's point of view than a sandy loam containing only 15 per cent. Physical experiments have been devised to measure the availability of water in different soils, and under carefully regulated experimental conditions the ratio between the water extracted by a given centrifugal force from different types of soil is found to accord very closely with that required by plants when growing on those soils. Exact correspondence is often disturbed in the open, where the conditions cannot so easily be controlled, but we are aware of most of the sources of divergence between theoretical and actually observed results, and we can to some extent control the matter, thus enabling the plant to utilize the soil water in a degree approximate to its theoretical value. The soil consists of larger or smaller particles, the surfaces of which are covered by a film of water. When water is withdrawn from a total mass of soil these films become very thin, and the surface forces

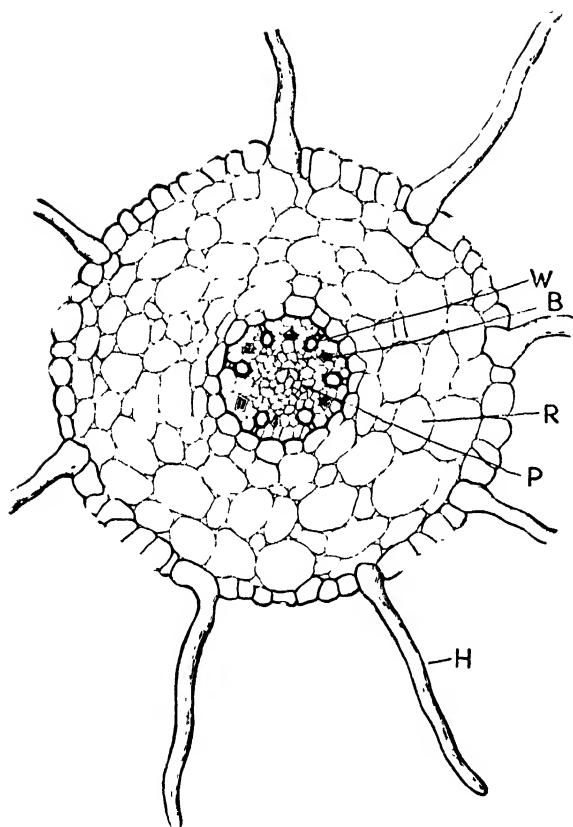


FIG. 43 — TRANSVERSE SECTION OF A ROOT

H, root-hair; R, cortex; B, bast; W, wood; P, pith.
 [From 'Plant Life,' by Prof. J. B. Lammie.]

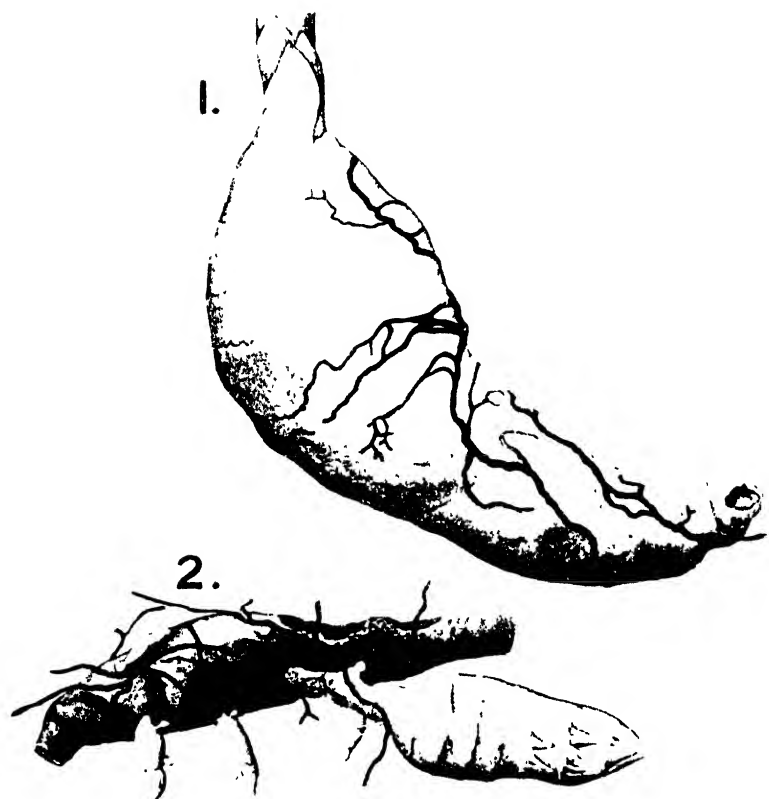


FIG. 41 -GASTRODIA AND RHIZOMORPHA
1, FLOWERING TUBER WITH FUNGUS ATTACHED, 2, TUBER THAT WILL GIVE
RISE TO FLOWER, ARISING FROM A FUNGUS-INFECTED MOTHER TUBER
(After Kusano)

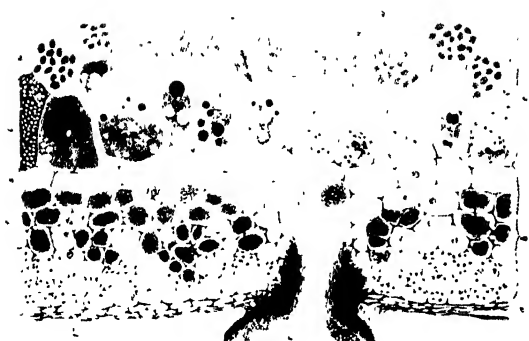


FIG. 45 SECTION OF GASTRODIA TUBER SHOWING PENETRATION
BY THE RHIZOMORPH OF *ARMIILLARIA MELLEA*
(After Kusano)

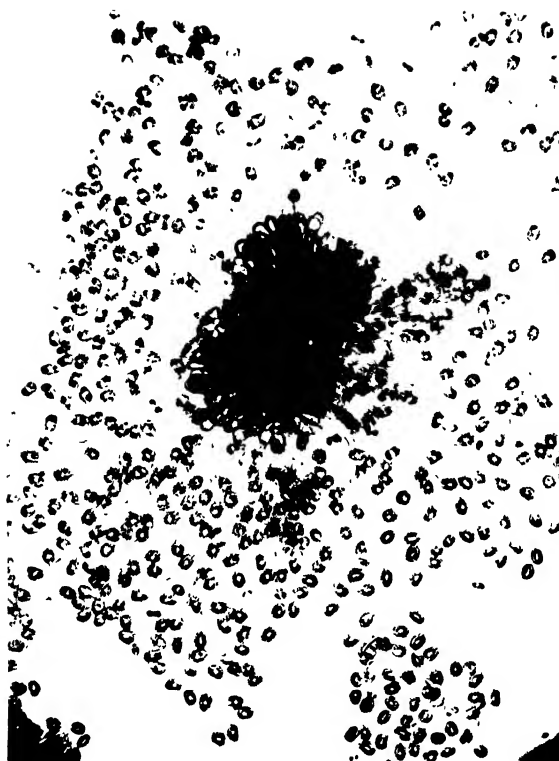


FIG. 10.—GERMINATING POLLEN GRAINS OF *SCILLA NUTANS*.
THE TUBES ARE TURNING TOWARDS THE
PORTION OF STIGMA IN THE CENTRE.

which cause the water to be retained on the particles of soil may finally balance the forces which operate in causing the water to enter the root. When this point is reached permanent wilting takes place. When the soil forms part of the ground, *i.e.* is not isolated from the rest of the surrounding soil, water continually flows from soil where it is more loosely held (*i.e.* is physically more abundant) to soil where it is deficient, till equilibrium is maintained. But this movement of the soil water may be too slow to satisfy the needs of the plant, and then recovery from wilting will not take place. In dry weather it is, as everyone knows, of great advantage to mulch the soil, and the most effective mulch is obtained by keeping the surface continually fined with a hoe. The explanation is to be found in the fact that when the top soil is disintegrated in this way the capillary passages are broken, and a mixture of soil and still air forms a blanket over the unbroken soil in which the water flow is taking place, consequently very little loss of water from the surface of the hoed ground occurs, and only that actually lost by the plants is of real consequence. I have seen a bed of roses, growing on sandy gravel soil, kept perfectly fresh after six weeks' dry weather, during which time not a drop of water had been given by hose or watering-pot. One sees the same sort of thing in a sand dune, where it frequently happens that the sand a few inches below the powdery surface is quite moist—sufficiently so to bind when squeezed in the hand. It is on the application of the foregoing physical facts that what is known as "dry farming" is rendered possible on a commercial scale. Further investigation is, however, needed to ascertain whether, and if so to what extent, the soil is able to increase its supplies of water from the air which enters it during cold nights, when the temperature of the ground may be greatly lowered by radiation. It may well be that some, but probably not all soils, gain supplies of moisture in this way which are large enough to be of material importance.

The relations of the plant to its physical environment are by no means exhausted by a consideration of some of the temperature and water factors. The gases of the atmosphere, light, and many other things have to be taken into account. We will glance at a few of these other points.

Everyone knows that the ordinary green plant does not derive its food solely from the earth, but that the carbon dioxide present in the atmosphere forms an essential food material. From this source alone the carbon, which is of such overwhelming importance in the whole of the chemical processes of plants, is obtained. Not only does carbon enter into the food and other essential materials within the plant, but it is an integral constituent of the vital substance itself. The steps by which the carbon dioxide and water taken into the plant undergo those complex changes which culminate in the formation of new living substance are being slowly traced, but the matter is too complex, even did time permit of it, for me to attempt to deal with the many problems which are involved. Suffice it to say that the sugars which are thus

synthesized provide the proximate starting point for those vastly complicated chemical operations which result in the formation of new life, and all that that may mean. But not the least wonderful part of the whole process lies in the small amount of carbon dioxide ordinarily available in the air—only some $2\frac{1}{2}$ –3 parts in 10,000 parts of air. The plant *could* use more, and, if supplied with it, is stimulated to increase the amount of chlorophyll granules—the special machinery of the cell more directly concerned with the process. Indeed, provided the light is proportionately increased, the plant is competent to utilize more and more carbon dioxide, until other reactions are set agog which progressively interfere with the process and finally arrest its progress.

Passing over these matters, we may, however, proceed to glance, in the light of what has been said, at one problem which is of practical importance to fruit-growers. I refer to the colouring of apples and such like fruit. We all know that there exists a considerable divergence of opinion amongst practical men as to what condition or conditions are of importance in promoting this colouring. We know that the colouring matter belongs to the class of complex bodies known as anthocyanins, and we also know that many plants, *e.g.* certain sorts of apples, produce them in the outer cells of the skin of the fruit, just as some other plants form them in their leaves, or in the petals, &c., of their flowers. One, amongst others, of the conditions that lead to the formation of these colours appears to depend upon the presence of a relative excess of sugary substances in the cell sap, and therefore anything that will tend to lead to an abnormal accumulation of dissolved sugar may also be expected to result in the appearance of colour.

It is easy to bring about the presence and the disappearance of a red colour in the leaves of some plants, *e.g.* of the water frogbit. All that is necessary is to expose the floating plants to bright sunlight at a low temperature. What happens is that the leaf cells under these conditions accumulate a relatively large quantity of sugar instead of turning the excess of it into insoluble starch. This dissolved sugar, which cannot be readily got rid of, begins to react with other substances in the cell, and one of the products thus formed is that which gives the red colour to the leaves. Under ordinary conditions of higher temperature this does not occur, because other chemical processes go on within the cell, leading to the formation of starch at the expense of the sugar. The latter thus does not become sufficiently concentrated to initiate the alternative reactions which lead to the production of colour. The chemical process thus outlined is reversible, and the red disappears if the plants are grown on at a higher temperature. Now it is apparently true that the apple is not so simple as the instance to which I have just referred. But that it belongs to the same *order* I have very little doubt. Complications are introduced by the conditions imposed by the bulky nature of the succulent fruit, and very likely also by the nutritive conditions present

in the soil, as well as by the supply of available water. Nevertheless a knowledge of the factors involved will certainly result in complete control over the colouring being ultimately gained, especially when the apples are grown in pots for exhibition or other special purpose.

Similarly, we ought to be able to control, better than we can at present, the colour development of many flowers. Recent investigations have shown that ferments, and in particular those which induce oxidative changes, are largely concerned in the matter, but although as yet we are entirely in the dark as to the precise nature of any ferment whatever, we are fully aware that the chemical processes which they stimulate are materially affected by the conditions of the environment. Probably light, and all it stands for, plays an important part, as it does in other vegetable processes. But it is also certain that the addition of certain constituents to the soil are by no means negligible. If anyone doubts this, let him experiment with some of the easy alpine, e.g. *Saxifraga oppositifolia* or *Saponaria ocymoides*. The addition of phosphate of potash to the soil will materially alter the colour of the flowers, and will, so far at least as my own experience goes, tend to cause them to approximate more closely to the vivid hues of the flowers when growing in their natural montane homes.

Time will not allow my attempting to deal with many other aspects of this part of the subject. We may, however, inquire how it is that the responses to the exigencies of the physical environment are often so strikingly apt, and it is worth while asking further if this is really as general as is often supposed, and indeed whether the apparent universality of adaptation is not liable to lead us by fallacious argument to unsound conclusions.

[As examples of these, the instance of *intercellular spaces* was discussed, and the difficulties occasioned by *excretion of sugar by lime trees* (honey-dew) and in other vegetative parts of plants were considered.]

The *variety* of response to similar environmental claims emphasizes still another aspect of the general problem, and the general conclusion arrived at is, to put it shortly, that the more closely we are enabled to analyse the response of a plant to the demands of the physical environment, the more we find the laws, so far as we know them, of chemistry, molecular physics, surface tension, and so forth hold good, and furnish us with the clue to the unravelling of the secrets of living things. Even auto-regulation, that wonderful property so commonly displayed by plants (and animals), can be shown, in at least some critical instances, to be explicable as the result of the operation of limiting factors not essentially different in kind from those which control chemical actions *in vitro*. In these directions lies our hope of gaining control over vital processes—a control which in a small measure we have begun to secure, though we have every reason to hope and expect that as our knowledge grows so will our power increase also.

THE PLANT IN RELATION TO ITS BIOLOGICAL ENVIRONMENT.

By Prof. J. B. FARMER, M.A., D.Sc., F.R.S.

[Read July 14, 1914; Dr. D. H. SCOTT in the Chair.]

Being the Twelfth "Masters Lecture."

THE vista of problems opened out by so comprehensive a title as that of "The Plant in relation to its Biological Environment" is a very long one. In the limited time at our disposal I propose to touch on a very few of these problems, but I hope that we may gain some idea of the way in which we may profitably attack them, and of the general nature of the conclusions that are to be drawn from a closer acquaintance with the problems themselves.

The most obvious relations existing between any one plant and its nearest neighbours perhaps is that of competition. Each successful individual develops as fully as circumstances enable it to do, without reference to, and often to the disadvantage of, the other members of a plant community. This state of competition is especially severe between the members of the same species, or between the individuals of species physiologically related to each other. It is often, but not always, less evident between species more remotely connected, though it is perhaps never really absent altogether. But if one dips a little below the surface of things, he soon comes to recognize that diversity of specific affinity implies, and probably depends on, differences of chemical nature, and the form of the problem thus assumes a greater degree of precision, although it may not thereby lose any of its complexity.

A relatively simple and intelligible instance of the effects of competition between nearly allied forms, physiologically speaking, is to be seen in plants that inhabit areas where any of the essential nutritive substances are either scarce or are only available at intervals. Plants growing under these conditions are physiologically liable to starvation, or at any rate they are exposed to periods of danger which prove fatal to all that do not possess special means of meeting them.

Desert plants afford an excellent example of what I mean. A desert condition may be produced by permanent scarcity of water with irregular rainfall, or it may be that the periods of scarcity are only of periodical, though of long-enduring, occurrence. The vegetation of the latter regions is very different from that in which true desert conditions prevail. In the real desert the persistent plants are at no time crowded, but they often possess a great root system

which penetrates deeply and ramifies widely. Each plant occupies a fairly well-defined position, and its sphere of influence is perforce respected. Each successful individual draws its water from the soil within its own area, and unless an interloper, better adapted than the original occupant, obtains a footing, it continues to exist alone, its isolation representing a kind of biological balance of power. The very fact of possession constitutes the title to its estate and to its own place under the sun, and possession is ensured by a root system appropriate to the physical conditions of the situation.

An analogous condition of things is also to be seen in the high Alps, where the species are commonly sparsely strewn on cliff, moraine, or mountain *débris*. This is partly to be attributed to the lack of available spots on a cliff, the shifting nature of the *débris*, and perhaps more than all to the combination of the low temperature of the soil, which restricts the rate of intake of water, with the drying conditions that so often prevail above-ground. The result is to produce many plants with remarkable root systems, though the problems are solved sometimes in other ways. *Eritrichium nanum* may be instanced as a high alpine "desert" type. It grows to greatest perfection, perhaps, on well-drained cliffs, and though it may be found in other kinds of situation, I have never seen it so fine as high up on the great south-facing precipice of the Meije, in Dauphiné. Hundreds of plants are growing there in a limited area, but they do not interfere with each other. It is possible, by detaching a slab of rock and so laying bare the roots, to understand the reason for their individual isolation. The root system is enormous for so small a plant, and that of a single individual may cover an area of several square feet with a delicate network. When one has seen how *Eritrichium* grows at its best, there is no room for surprise at its natural isolation, or at the difficulty that attends its cultivation under the ordinary conditions of the rock garden.

But there are other factors which become operative amongst the plants that are adapted to live under conditions apparently more social. A crude competition is the simplest expression of such a state, although as a matter of fact the situation is always seen to be more complex under actual nature conditions. One commonly finds areas occupied, not by a single species, but by many species, and these live together in a nicely balanced proportion which is often maintained over long periods of time. The physical conditions of moisture, climate, soil, and the like, determine the gross outlines of the flora of any particular locality, but within those main limiting circumstances the relations between plant and plant are adjusted with extreme nicety, and may vary between sheer competition and absolute interdependence.

It is a significant fact, which hardly seems to have attracted the full attention it seems to me to deserve, that one of the frequent concomitants of specific differentiation consists in the lessening of the direct competition between very closely allied forms. If one observes

the plants that are actually flowering at the same time, it soon becomes apparent that whilst it is easy to collect representatives of different *genera*, the different species of a genus which are flowering together are in the great majority of instances not very closely related. Moreover, where this does not hold good, the related species are commonly restricted to different types of soil or habitat, and so do not really come into strenuous competition at all. One has only to think of the *succession*, in time of flowering, of allied species of Umbelliferae, Compositae, Caryophyllaceae, Saxifragaceae, &c., and at the same time to recall how definitely the contemporaneously flowering allied species respectively of Heath, Rhododendron, Primula, Gentian, &c., are segregated by soil preference or habitat. This point is especially brought out by a consideration of the calcareous and siliceous species of many nearly related alpine, *e.g.* *Achillea moschata* and *A. atrata*, which in one valley are commonly severally confined to the non-calcareous and calcareous soils, though in the absence of one of them the other seems able to occupy both sorts of soil. It is of course a matter of common horticultural experience that a wild plant, when introduced into cultivation, will often flourish in soil and under other conditions very different from those to which it is restricted in its natural state.

I take it these facts, which anyone can easily observe for himself, really mean that the change involved in the production of the new variety, mutant, or whatever we may call it, is one which affects its chemical processes. Just how this change will take effect cannot be predicted in any particular instance, and it is evident that it might operate in a variety of different ways, each, *ceteris paribus*, representing some advantage to the new form. Any change, however, that lessens the active and actual competition must tell in favour of the individuals concerned, whether this depends on a slowing down or hurrying up of the nutritive processes, so as to shift the time at which the different races are competing for the same food, or whether it depends on a more fundamental change, such as would result from an alteration in the proportion of the food constituents actually required. I have little doubt that it is in changes of this sort that the origin of the so-called "replacing species" of alpine and other plants is to be sought, but each case needs to be studied by itself in order to unravel its tangled history. It is evident that a segregation, whether in time of flowering, for example, or in locality, provides the best opportunities for the persistence of new races and species as they come into existence. This will be equally true whether we recognize or whether we refuse to admit the swamping influence of intercrossing.

I have already pointed out that the vegetation of most places is a mixed one. The exceptions to this depend upon special conditions of soil, or other physical circumstances, to which only a limited number of species are fully adapted. These plants are consequently able to exclude others from gaining a foothold, even if the latter, supposing they were introduced, could manage to persist.

The chemical processes of some of the constituent species of mixed

types of vegetation are sometimes of such a nature that one may be able to take advantage of the waste products of another. This is notably true of a number of bacteria and moulds, and the common occurrence of a regular succession of forms of these lower organisms illustrates this point. The remarkable relation of the nitrifying organisms to each other serves as an example to show how one species not only may pave the way for the entrance of another, by oxidizing a compound that is directly poisonous to the associated organism, but by this very process of oxidation may provide it with essential means of subsistence.

A study of the relation of the higher plant to various fungal species is full of promise, both from a practical and a theoretical point of view. The cultivation of orchids has been facilitated by the discovery of the general nature and mode of infection of the germinating seedling with the so-called symbiotic fungus. One of the most interesting, and from a theoretical point of view important, instances of the relation of an orchid with a fungus is that of the Japanese species *Gastrodia elata*. We are fully acquainted with its remarkable life-history, and it is one of the very few instances in which we are sure of the identity of the infecting fungus. *Gastrodia* is a terrestrial species which forms underground tubers. These only produce flowers when they have been infected with the rhizomorph of *Agaricus* (*Armillaria*) *melleus*, which is often parasitic on the trees amongst which the orchid grows. (Figs. 44 and 45.)

There are many theories (or rather hypotheses) as to how the association of the root and fungus to form a mycorrhiza is brought about, and as to the relation to each other which subsists between the two symbionts. But the examples that have been investigated leave no room for doubt that the relation is essentially one of parasitism. The *degree* of infection, however, is checked by the root, in some way not as yet fully understood; I shall return to this later and shall attempt to show that it is not as exceptional as it may perhaps appear to be. For the present it will suffice to say that, while in many cases the fungus seems to thrive, but fails to penetrate the deeper tissues of the root, in others it invades the whole plant, without, however, doing it any harm. In others, again, certain tissues of the host plant have obviously and definitely the power of destroying it after it has infected them and thriven for a while in their interior. But the mycorrhizal association itself is always beneficial, and often indispensable. Interference with the fungal symbiont is, at least in some instances, a main reason for intolerance of a calcareous soil, though the influence of the calcium carbonate may be very indirect. Thus it would seem that for certain calcifugal heaths the inimical influence of the chalk is due to its facilitating the development of certain bacteria, which in their turn are prejudicial to the mycorrhizal fungus of the roots of the heaths. More investigations are urgently needed, especially on lime-enduring heaths, e.g. *Erica carnea*.

The influences which enable a parasite to obtain entrance into

the body of its host plant are at least two-fold in nature. First there is the attraction, which directs the attack, and secondly there is the actual method of penetration. It is probable that in all cases the sense of direction is given by some substance that exudes from the host plant, and that this serves as the means of attraction which determines the direction of growth towards it on the part of the parasite. An excellent example of this is presented by germinating pollen grains. The pollen tubes, which convey the fertilizing material to the ovule, are indispensable to the setting of good seed in the majority of the higher plants, nevertheless the pollen tubes themselves are to be regarded as being parasitic on the tissues which they traverse. They feed at the expense of the tissues through which they grow, just as do the mycelial hyphæ of a fungus. They are guided, in their first entrance through the stigma, by the exudation of a sugary substance which is emitted from the superficial cells of that organ. The presence of this sugar determines the direction of growth, as may be easily proved by allowing pollen grains to germinate on the surface of agar-agar. At first the tubes grow out in all directions, but if a piece of ripe stigma is placed on the slide the tubes will soon deviate from their indifferent paths, and will grow towards the source—*i.e.* the stigma—in which the stuff that excites their irritable movement is most abundantly present, and from which it is diffusing through the agar. The annexed figure (Fig. 46) presents a photomicrograph of pollen tubes of the common Bluebell (*Scilla nutans* Sm.) which are thus turning chemiotactically, as it is termed, towards a bit of stigma. The hyphæ of fungi are endowed with the same faculty of chemiotaxis, which, indeed, is a very widespread phenomenon among plants, and is to be also discerned in the way in which roots will grow towards and invade richly manured land. Sometimes, however, the parasite itself emits the chemiotactic substance, and then it causes its prey to grow towards itself. In other instances, *e.g.* the Broomrape, the seeds will not germinate unless they are in close proximity to the roots of a suitable host plant.

What we call predisposition on the part of a plant to disease is probably largely a matter of inability on the part of the plant exposed to infection to prevent the exudation of chemiotactic substances, which thus guide the hyphæ of a germinating fungus spore and cause them to penetrate the epidermis of the plants they infect.

Immunity from attack may be due to a variety of causes. A thick cuticle, besides preventing the exudation of chemiotactic substances, often prevents the entrance of the invasive hyphæ, because they have no means of penetrating it. Entrance is then effected either through natural orifices, the stomata, or through wounds, as is perhaps most often the case with fungi such as those responsible for the Larch disease (*Peziza Wilkommii*) or the apple and beech canker (*Nectria*). There is a considerable body of evidence to show that the wounds produced by animal sucking-pests, *e.g.* the Beech coccus and the American blight, furnish the ordinary means

for the entrance of the fungal disease. When once inside the host plant, a fungus often attacks special tissues, mainly perhaps because its special ferments enable it to utilize certain constituents of the plant body more easily than others, but partly because it may be restrained from entering the cells of other tissues. Each case has to be studied for itself; and even closely related species, *e.g.* of *Nectria*, exhibit considerable differences in the form of attack on the interior tissues of the plants they may have invaded.

The limitation to special external layers of the cortex which is to be seen in the case of many mycorrhizal fungi probably indicates some prophylactic power resident in the cells of more internal layers. That plants are able to restrain the growth of fungi is shown by a study of nectaries, both floral and extra-floral. I have been unable to find that any special investigations have been made by others as to why nectaries, with their exposed sugary surfaces, should be practically immune from the attack of moulds and yeasts. But the results of experiments which I am now carrying on seem to point to the presence of some inhibiting substance which prevents the spores from even germinating on a medium which might have been expected to be very suitable for such a process.

The presence of cuticle undoubtedly prevents the entrance of some pests. Thus the germ tubes of *Botrytis*, according to experiments now in progress at the Imperial College, are unable to attack it; that is to say, they secrete no ferment which is competent to dissolve it. But if they once obtain an entrance, through a wound or in other ways, they rapidly act on the middle lamella, and bring about a speedy disorganization of the tissues. It has been found possible to extract this active substance and examine its disintegrating effects on a variety of plant tissues, and thus to elucidate the way in which this pest brings about the death of its host plant.

Many parasites, especially those of a more advanced type, influence their hosts in another way. They do not kill, at least not at once, but they interact with their host in various remarkable ways, producing definite kinds of growths or galls. Amongst the flowering plants, the tropical parasites belonging to the order Balanophoraceae attack the roots of other Angiosperms. The parasite itself is greatly reduced; it would scarcely be recognized as a flowering plant at all, for it consists at first merely of an undifferentiated mass of cellular tissue within the body of its host. It causes copious branching of the root of its victim at the seat of infection, the whole forming a tuber-like body, and consisting of a crowd of rudimentary roots all interpenetrated by the cells of the *Balanophora*. Only later is a flowering stem formed within this mass of cellular tissue, from which the parasite finally bursts forth as a many-flowered inflorescence of relatively large size and remarkable form. Many of the fungi belonging especially to the rusts and smuts produce exuberant growth on the part of their hosts, and I will instance especially the species known as *Ustilago Treubii*, which infects *Polygonum chinense* in Java. It causes

curious outgrowths to sprout from the stem, and these present a striking resemblance in form to the fructifications of the higher fungi. They consist, however, for the most part of tissue derived from the flowering plant, which bear within themselves the reproductive spores of the fungus. These remarkable structural peculiarities which so often result from the interaction of host and parasite are of the greatest theoretical interest, inasmuch as they emphasize the dependence of form upon chemical constitution, but to pursue this further would take us more deeply into a speculative field of inquiry than is permitted during the few minutes that remain at our disposal. A more immediately profitable line of investigation is that which is directed towards the ascertaining of the causes and conditions of immunity, and of the means, whether by breeding or otherwise, whereby immune races may be raised and preserved. The meaning of predisposition, in the various species and varieties, similarly requires to be studied, for it is only when we have rightly understood the causes that we can expect to grapple with the onset of disease with certain success. It is work in which the horticulturist should largely set the problem, which it is the business of the botanist and the chemist to solve. Science and practice are sometimes ignorantly spoken of as though they were distinct, and even antagonistic. A better knowledge is now prevailing, and dispersing this fundamentally wrong conception of the matter. Science and practice are really so closely akin as to be almost interdependent, and the focusing of the joint efforts of such a triad of workers as I have just indicated can only result in good to horticulture. The extension of the confines of chemistry and botany that must ensue will result in a further increase of our power to direct and control the processes that go on within the living plant. Hence we may with confidence predict that we shall one day bring within the sphere of ordinary practice much that, for lack of knowledge, is still impossible.

CHINESE TREES AND SHRUBS.

By W. J. BEAN.

[Read May 5, 1914, Professor F. KEEBLE, M.A., F.R.S., in the Chair.]

EVEN before the recent exploration of the flora of Central and Western China, one could not complain of any lack of variety or beauty amongst the hardy trees and shrubs already existing in gardens. The "Hand-list of Trees and Shrubs" published at Kew in 1902 enumerated about 4500 species and varieties. A new tree or shrub, therefore, to justify its introduction to gardens, either should be distinct from those we already possess, or it should have greater beauty than its immediate allies already in cultivation, or be hardier and more easily cultivated than they are. No useful purpose is served by bringing into gardens a new plant, however pretty, which differs only in some minute botanical particular from another already plentiful there. Still less, of course, do we want weedy and indifferent ones. When I was in Ireland last year, I was told a little story rather apropos to the present occasion. A horticulturist, whom you all know very well by name, was being conducted round a garden by the proprietor, who pulled up in front of a plant in full blossom. "That," said he, with an intonation of pride, "is the first time that plant has flowered under cultivation. It was brought by So-and-so from China." Our friend gazed at it for a short time in silence; then he said, "Well, all I can say is, So-and-so ought to be made to take it back again."

I shall have no difficulty in showing that gardens owe an immense debt of gratitude to Mr. WILSON and to those who sent him to China. It is a matter of legitimate pride for us of this country to know that it was an English firm, that of the Messrs. VEITCH, who first inaugurated the exploration of Far China in the interests of horticulturists alone. This is not belittling the valuable work done by French missionaries, who were the first to send to Europe many plants of Western China, nor that of the Jardin des Plantes at Paris and M. MAURICE DE VILMORIN, who were the first to cultivate them. Their collecting, admirable as it was, was little more than the occupation of a leisure time sandwiched in between other duties, and, after all, was more important for the herbarium than the garden. And the same has to be said for the remarkable botanical exploration done by Professor A. HENRY, now of Dublin.

WILSON was sent by the Messrs. VEITCH to China for the first time in 1899. He made a second journey for them in 1903. Thanks to the public spirit of that firm, much good botanical work was

done on these two journeys, but primarily their object was the introduction of new and beautiful plants to European gardens. Since then WILSON has made two other journeys in the same extensive field, in the interests of Harvard University, Messrs. VEITCH, and various subscribers. These took place in 1907-1909 and in 1910-1911, and had not so wholly horticultural an object.

WILSON'S work may be briefly summarized thus: He has sent home seeds or cuttings of over 1500 different plants, a very large proportion of which had not been seen before in Europe, or, if they had, in such small quantity as not to count. He has made some 65,000 sheets of herbarium specimens, comprised in some 5000 species; and among his discoveries have been found up to the present four new genera and over 400 new species. It is evident, therefore, that in the time at my disposal this afternoon I cannot treat my subject otherwise than very cursorily.

I think a very fair estimate of the value to gardens of WILSON'S new plants may be made from the records of this Society's Floral Committee. Up to the present, almost exactly one hundred First-class Certificates and Awards of Merit have been given to WILSON'S introductions. If one might judge from the opinions expressed by people who put plants before it, the Floral Committee (to which I am proud to belong) has two rather bad failings. It gives distinctions to plants which do not deserve them, and it withholds them from those that do. But in relation to WILSON'S introductions these two peculiarities of the Committee (supposing they exist) may be said to neutralize each other. If some have received unmerited awards, others that deserved them have gone away undistinguished. When we remember that WILSON'S last journey ended in 1911, and that a large number of his plants are not yet old enough to show their best, the fact that already one hundred different plants have been distinguished by the Floral Committee constitutes a great record.

The introduction of *Davidia involucrata* in quantity was one of the chief objects of WILSON'S earliest journey. Seeds had already been introduced to France in 1897, but from them a single plant only was raised. This tree, which grows in M. MAURICE DE VILMORIN'S collection at Les Barres, and a few plants raised from it, were the only examples in Europe until WILSON introduced thousands of seeds in 1901. They germinated well and established the tree on a sure footing in European gardens. The *Davidia* is said to be one of the most beautiful flowering trees in the northern hemisphere; but its capabilities in this country have yet to be proved. Two trees flowered at Kew last year, and it has flowered elsewhere, but it is too youthful yet to show its true character. Of its hardiness and capacity to thrive I have no doubt. It has two admirable qualities for a tree to possess in our climate: it starts into growth fairly late and finishes early.

An extremely interesting introduction is *Aesculus Wilsoni*—a new Horse Chestnut from Hupeh, allied to the Indian Horse Chestnut



Photo Wallis.

FIG. 47 - *PARUS (MICROMELIS) FOLIGNERI*

To face p. 70

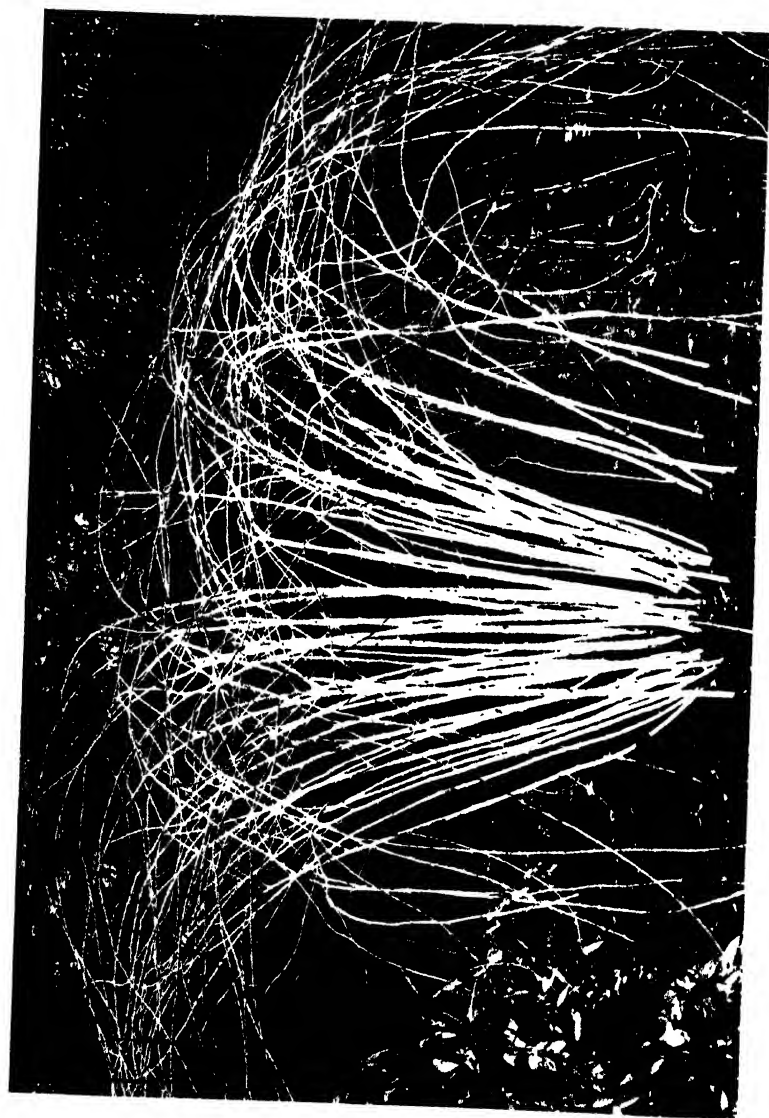


FIG. 48.—ROOTS, *Gleichenia*.

Photo. Wallis

(*Ae. indica*) and the North Chinese one (*Ae. chinensis*). These three, all now in cultivation, form a distinct and beautiful group, and WILSON's species is probably the finest. I have a dried panicle of flowers 16 inches high and 4 inches through at the base.

WILSON found about twenty Hollies, of which I think *Ilex Pernyi* will prove most attractive in gardens. *Ilex yunnanensis* is also a very pleasing, compact, small-leaved evergreen, and *Ilex pedunculosa* is remarkable in bearing its red fruits on a stalk $1\frac{1}{2}$ inch long.

Corylus chinensis is of the same group of Hazels as the Constantinople or Turkish Hazel, and is likely to prove a fine tree, very distinct from the common type of bushy Hazel.

Visitors to the South of Europe and the Grecian Isles will be very familiar with two or three species of *Pistacia* that grow there. There is *Pistacia vera*, which gives the well-known Pistachio nuts; *P. Terebinthus*, which yields a sweet-smelling resinous juice used in medicine and for flavouring; and *P. Lentiscus*, which produces a resinous substance known as mastic, used as a dentifrice. Not one of these, however, is genuinely hardy, but WILSON has introduced a new species, *P. chinensis*, which is evidently perfectly hardy. The Chinese eat the young shoots and leaves boiled, much as we eat Spinach. The Chinese eat such fearsome substances that it would be rash to infer from this that a new vegetable has been obtained. But Mr. WILSON has told me the leaves turn such a gorgeous crimson before falling as to make a large tree one of the most wonderful of autumnal pictures in Western China.

Populus lasiocarpa and *Salix magnifica* are two of the marvels Western China has revealed. Both are remarkable for a size of leaf transcending anything among Poplars and Willows we knew of before. I have gathered leaves of the Poplar 14 inches long by 9 inches wide; and the Willow has borne them 10 inches long by 8 inches wide—truly extraordinary dimensions in the genus *Salix*. The Poplar is noticeable, too, for the rich red of the stalk, midrib, and veins of the leaf. This tree will probably be seen at its best on its own roots. I have been told by Mr. WILSON that he once came to a little Chinese farm where the farmer had made an enclosure for his animals by driving stakes in the ground; these were of *Populus lasiocarpa*, and they had taken root freely.

Pyrus Folgeneri is a very elegant tree, more nearly allied to the Whitebeams (*Pyrus Aria* &c.) than to any other of the old groups of *Pyrus*. During the recent craze for cutting up genera, a new genus called *Micromeles* has been cut away from *Pyrus*, and to this *P. Folgeneri* belongs. The tree is variable in habit. A tree in the Coombe Wood nursery last year showed an almost Willow-like grace, and its leaves were vividly white beneath (Fig. 47).

Cunninghamia sinensis, the Araucaria-like conifer, has long been known in gardens, having been introduced in 1804. It has never been a great success under cultivation, and the finest trees are only to be seen in the south-western counties. WILSON found immense

forests of it in Western China, and collected seeds from trees at such high altitudes as to lead him to believe that they represent a hardier form. We have had no winters in recent years to put new plants to the supreme test, but certainly these newly introduced Cunninghamias seem much hardier than the older ones.

Liquidambar formosana is one of a group of trees remarkable for the richness of their autumn tints. They are curiously scattered over the northern hemisphere. One species, *L. orientalis*, is a native of Asia Minor; the better known *L. styraciflua* is from eastern North America. *L. formosana* comes from China, where it is widely spread. Tea-chests are made of its timber. WILSON found a mountain form which will no doubt prove hardier than the previously introduced one which at Kew needs wall protection.

Another instance of WILSON's finding a hardier variety than the one previously in cultivation is furnished by his plants of the Varnish-tree—*Rhus vernicifera*. They grow twice as fast as, and are already much bigger than, Japanese trees introduced twenty years before they were.

The *Ginkgo* or *Salisburia* is still unknown in a wild state. Possibly it may yet exist in Nature somewhere in the vast tract of South-West China still unexplored by plant collectors. It reaches its finest development in Western China, where trees 90 feet high and over 7 feet in diameter of trunk are to be found.

WILSON has discovered some three or four new species of *Paulownia*, none of which, so far as I know, has flowered under cultivation. A new variety of *Paulownia imperialis*, distinguished as var. *lanata*, is among them. The difficulty with *Paulownias* in our climate is that they set their flowers in autumn. Although the flower-buds are perfectly capable of withstanding our severest frosts, they expand under the warmth of early spring, only to be cut off by later frosts.

Whilst I am doubtful as to the garden value of many of the Chinese Brambles and Raspberries, they represent as a whole one of the most remarkable groups of WILSON's introductions. The distinctness of a large proportion of them from the species we had in cultivation previously is astonishing, and they have given the genus a quite new aspect in our eyes. There are the creeping *R. irenaeus*, for instance, with leaves recalling those of a Coltsfoot in shape and size; *Rubus Playfairianus*, with leaves like an *Ampelopsis*; and the very distinct *R. polytrichus* or *tricolor*, which I recently saw forming a dense dwarf cover over great patches of ground at Caerhays.

A very interesting series among them are the new forms with white stems. Opinions may differ as to their beauty, but not as to their striking character. For many years there have been in cultivation two Brambles with this character well marked—namely, *R. biflorus* from the Himalaya, and *R. leucodermis* from western North America. They are surpassed in effectiveness by the new *Rubus Giralduanus*, whose stems grow about 7 feet high, then arch over in fountain-like manner so that their tips touch the ground, where they take root

In their vivid whiteness and grace, the leafless stems make one of the most striking of winter pictures (Fig. 48). Another very handsome *Rubus* is called *thibetanus* or *Veitchii*. Its stems are of a bluer, less vivid white than those of *Giraldianus*, but the foliage, in its fern-like cutting, is perhaps the handsomest among these new species.

Among *Viburnums* there are several of very distinct appearance. *Viburnum rhytidophyllum*, with its curiously wrinkled leaves, is by now known to most cultivators. Its garden value is in its fruits, which turn first brilliant red, then black. As an ordinary evergreen for shrubberies or for grouping it has a defect in winter. If planted in a position at all exposed it looks during cold spells shrivelled and extremely sorry for itself. With the return of spring, however, it loses its dejected appearance and the leaves regain their fulness. It sets its blossoms in autumn, and they remain in the bud state uninjured all the winter, opening normally in May.

V. Henryi is another evergreen species, rather thinly branched and sparse of leaf, but very handsome when laden with red fruits. *V. utile* is more attractive for its blossom. *V. Davidii* represents a very distinct group of *Viburnums* with strongly 3-veined leaves and blue fruits. *V. coriaceum*, too, with pink cylindrical flowers, differs from every other species in cultivation by the thin waxy layer on the leaves, which turns white when rubbed, or when the leaf is bent.

One of the most interesting facts in connexion with the distribution of plants on the face of the globe is the close affinity of the flora of China and other parts of North-eastern Asia with that of eastern North America. At an earlier stage of the world's history the land connexion between North America and Asia in the neighbourhood of the Behring Sea and Behring Strait appears to have been extensive, and the temperate flora reached much nearer the North Pole than it does to-day. That part of the globe where these two continents nearly meet, now too cold to support much vegetation, was covered with a fine sylvia. As the polar ice-cap descended, the warmth-loving vegetation was squeezed gradually southwards, one part passing eastward into North America, the other westward into Asia. The Rocky Mountains appear to have acted like the points on a railway and diverted the receding flora to the eastern side of America. At any rate, the flora of western North America, although geographically much nearer that of China than the eastern one, is far less closely related to it. Such well-known genera as *Magnolia*, *Hamamelis*, *Catalpa*, *Stewartia*, and *Wistaria* are but a few that illustrate this interesting phenomenon of the same genus being represented on the Atlantic side of North America and in North-eastern Asia, but neither on the Pacific side of North America nor anywhere else.

One of the most interesting things in connexion with WILSON'S discoveries and introductions from China has been the production of further evidence in support of the theory thus crudely defined.

In connexion with the same question is the curious phenomenon of what would appear to be dying or disappearing races which at the present time are represented only by a solitary species in China, and by another one, equally solitary, in East America. There are the two *Liriodendrons* or Tulip-trees, for instance. The American Tulip-tree, so well known and admired in this country for over two hundred years, is not only one of the most magnificent deciduous trees of the globe, being 190 feet high in the Southern Alleghanies; it was, until 1875, distinct from every other known tree. In that year the Chinese Tulip-tree was discovered, and now, thanks to WILSON, we have it in our gardens. It is not, apparently, so fine a tree as the American one, for it has not yet been found over 100 feet high, but it is remarkably similar to it.

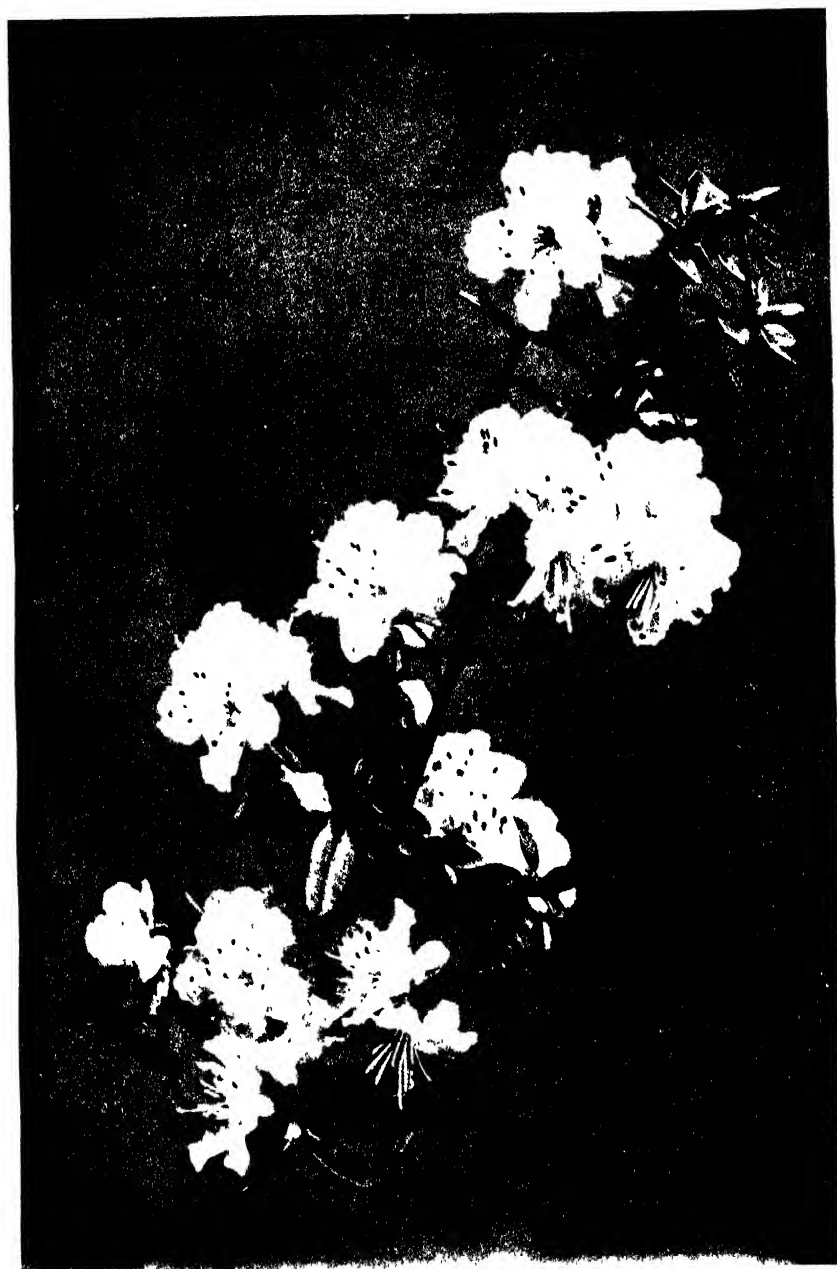
A second instance is provided by the genus *Cladrastis*. From eastern North America was long ago introduced that beautiful tree we know as "yellow wood" (*Cladrastis tinctoria* or *Virgilia lutea*). Until about twenty years ago it was regarded as monotypic, but in 1901 WILSON sent home from China another species, *Cladrastis sinensis*, which is thriving well in our gardens. Judging by dried material, it is very handsome in flower. WILSON has, indeed, described it as one of the most beautiful of all Asiatic trees.

Most of you will know, at any rate by repute, the *Sassafras* of North America. I am afraid it is now rather uncommon with us, although H.R.H. the Duchess of Albany has a splendid tree, 70 feet high, at Claremont. Its spice-scented, curiously shaped leaves make it a very distinct and interesting tree, until lately quite unique in gardens. HENRY, however, found another species in China, as solitary there as its ally is in Eastern America. WILSON introduced it, and a few plants are now in cultivation.

Several other of WILSON's discoveries and introductions might be mentioned that further illustrate this curious inter-continental relationship. He has, for instance, found a new *Symphoricarpos*, a genus hitherto only known to us by the North American species. Amongst them were the well-known 'Snowberry' and the red-fruited *Symphoricarpos orbiculatus*. But this new Chinese species, now in cultivation, is described as having blue fruits.

Then there is the interesting genus *Nyssa*, to which the tree popularly known as Tupelo belongs—one of the best autumn-colouring trees we have. This genus was long thought to be exclusively confined to the south-eastern United States, but Professor HENRY discovered, and WILSON has introduced, another species from China—*Nyssa sinensis*.

Owing to WILSON's labours, some of our most important groups of trees and shrubs have been very much augmented, and their importance in gardens much increased. Most striking of them all probably is *Rhododendron*. For many years after Sir JOSEPH HOOKER's travels in Northern India, the Himalaya was regarded as the headquarters of this genus. The exploration of China, however, has



[Photo Wallis.

FIG. 49.—RHODODENDRON FLAVIDUM

[To face p. 220.



Fig. 50 - *MILIOSMA CUSPIDATA*

Uploro Wadus



FIG 51 - SPIRAEA ARBOREA VAR. GLABRATA

[*Pinetel* Wallis



FIG 52 —*POTENTILLA VEITCHII*

[Photo Wallis.

[To face p* 221.

shown that in the western and south-western regions of that country there is the greatest aggregation of species on the globe. At the present time 160 different species of *Rhododendron* are known to exist in China, and of these WILSON has introduced at least sixty in a living state.

Their value to gardens is evident in several respects. In the first place, they enable those of us whose gardens are not situated in Cornwall, South Wales, Ireland, or in places with a similar climate, to grow *Rhododendrons* of a type approaching the large-leaved Himalayan ones. Such species as *R. auriculatum*, *sutchuenense*, *calophyllum*, *discolor*, *Fargesii*, *Souliei*, and *orbiculare* represent types of *Rhododendron* which, previous to their introduction, could only be seen growing in the open air in our mildest counties.

Another interesting quality pertaining to some of WILSON'S *Rhododendrons* is the yellow colour of the flowers. A really fine yellow *Rhododendron* is one of the greatest desiderata of gardens. Imagine one with a truss like the variety 'Cynthia' or *fastuosum*, and flowers of a genuine golden or buttercup yellow! I do not know of any Chinese *Rhododendron* that approaches that ideal, but I believe there are others to be introduced, or at any rate brought into flower, of a finer yellow than any we have seen. The most charming of WILSON'S yellow species is, I think, *R. flavidum*—a delightful dwarf shrub whose flowers are primrose-yellow (Fig. 49). Other yellow ones are *ambiguum* and *lutescens*, both somewhat anæmic in hue, but worth growing.

A very pleasing group of *Rhododendrons* is that of the dwarf-growing ones suitable for the rock garden. This group has been most attractively increased by the introduction of species like *intricatum*, *nigro-punctatum*, *fastigiatum*, *moupinense* (shown at this Hall in flower by Miss WILLMOTT last February) (Fig. 31), and *R. flavidum*, already referred to. The hidden stamens, so characteristic of *intricatum*, are seen also in the Himalayan *anthopogon*.

Speaking of WILSON'S *Rhododendrons* as a whole, they have brought many new and charming types into our gardens, and they appear to be mostly hardy. Their chief defect in many parts of the country will be in flowering too early in spring to escape frost. The hardiest of them are undoubtedly the small-leaved group, whose leaves and young shoots are more or less covered with scales. These *Rhododendrons* cover great areas on the mountains of Western China to the exclusion of nearly all other shrubs, and fill the same place in the flora there that such things as Heather and Gorse do here. Some of the best of them are *racemosum*, *yunnanense*, and *Augustinii*. The broad-leaved ones, Mr. WILSON tells me, usually inhabit the margins of forests in semi-shade.

Meliosma is a curious out-of-the-way genus which has been represented in gardens by a single species only—introduced by MARIES from Japan in 1879, and too tender to get into general cultivation. WILSON has introduced several other species, of which the only one

that has yet flowered is *M. cuneifolia*. Its panicles of small white flowers are scented like Hawthorn (Fig. 50).

The genus *Styrax*, hitherto fairly well known by *S. japonica*, has been recruited by several new species. The two best are *S. Wilsonii*, shown very prettily in flower by Miss WILLMOTT before this Society last year, and *S. Hemsleyana*, of which the finest example in the country grows in the grounds of Caerhays Castle. Its flowers recall those of *Styrax Obassia*. *S. Veitchiorum* with large pinnate leaves like a hickory is very striking.

A considerable number of *Spiraeas* have been sent to us from China, but on the whole they do not add much that is new or of value to our collections. The two best, I think, will prove to be *Spiraea Veitchii*, the finest species of the *canescens* or *flagelliformis* group; and *Spiraea arborea*, which is a close ally of *S. Lindleyana*. It is, however, said to assume a tree-like habit and become 30 feet high—rather remarkable dimensions for a *Spiraea* (Fig. 51).

Potentilla Veitchii (Fig. 52) is closely related to our old friend in gardens, *P. fruticosa*. It has white flowers and foliage of a silvery hue, and is one of the most striking of its group.

Of *Deutzias* the finest, I think, is *D. longifolia*, which has several times been shown in first-rate condition at the Society's meetings. Some forms of *Deutzia discolor* are also very fine. (Fig. 53.)

Another genus of shrubs much enriched by WILSON'S discoveries is COTONEASTER. Previous to their introduction the majority of cultivated Cotoneasters, and the best of them, were of Himalayan origin. These new Chinese species have brought several quite fresh types into gardens. There is the group of evergreen species, for instance, with rugose leaves, represented by *Henryana*, *bullata*, and the forms of *salicifolia*, all with handsome red fruits; the prostrate *C. Dammeri* or *humifusa*, and the very graceful *C. Dielsiana* (*applanata*). *C. divaricata* is more in the way of *C. Simonsii*. Altogether WILSON has added to our collections at least two dozen new Cotoneasters, most of them quite distinct from anything we had before. Considering how beautiful they are, how easily accommodated in gardens, this number represents a very substantial contribution to the garden flora.

Diospyros Lotus is an ally of the Persimmon and Kaki (whose fruits are often to be purchased in London shops). It has been cultivated in South Europe for centuries, and in a few places in England since early in the seventeenth century. WILSON introduced it abundantly from China, where it grows 80 feet high and has a trunk 12 feet in girth.

Of climbers the two chief genera are *Clematis* and *Vitis*. The various forms of *Clematis montana*, and especially the variety *rubens*, in combining a great beauty with a hardy and accommodating nature, make some of WILSON'S choicest introductions. A very promising species also is *Clematis Armandii*, especially for wall cultivation. It

is evergreen, and has striking foliage and large white flowers. There are, however, two forms of it in cultivation; one, with narrow sepals, is scarcely worth cultivation, but the other, with broad, thick sepals, possesses a beauty rivalling that of *Clematis indivisa* from New Zealand. It appears to be quite hardy on a wall, flowers in April, and has a pleasing fragrance. I recently saw it, very beautiful, on a house in the Cotswold country. *Clematis Spooneri*, an ally of *C. montana* but very much more downy, is also full of promise.

Of WILSON'S vines the most remarkable is *Vitis megalophylla*, with doubly pinnate leaves up to 2 feet long, and absolutely unlike anything we had before among hardy vines. Of greater value in gardens, however, are *V. Henryi*, with its Virginia Creeper-like leaves variegated with silvery white and pink; *V. Thomsoni*, with claret-purple leaves; *V. armata* and *armata Veitchii*, magnificent in size of leaf and autumn colouring.

A wonderful privet is *Ligustrum lucidum*, 60 feet high, with a trunk nearly 4 feet through. It is sometimes seen in tree-like form in the warmer part of the British Isles, and two years ago I saw it, about 40 feet high, in the public garden at Spalato, in Dalmatia.

Dipelta floribunda is an ally of the Diervillas, remarkable for two shield-like bracts beneath the fruits (Fig. 54).

The Roses of Western China consist very largely of forms or allies of three species—namely, *Rosa moschata*, *R. macrophylla*, and *R. sericea*—all of them long ago introduced to our gardens from the north of India. One of the greatest difficulties we have encountered in dealing with many new Chinese trees and shrubs is to disentangle them from the well-known Himalayan types. Whilst many are not exactly the same as their North Indian prototypes, they differ in such small particulars that botanists have been chary of making new species of them. That, however, is being found the simplest way of dealing with the new Roses. Miss WILLMOTT has given pictures and descriptions of a goodly number—all, I believe, published up to date—in her new work on Roses. On the whole I think the most remarkable of WILSON'S Roses is *R. Moyesii*—an ally of *R. macrophylla*, but bringing a quite new shade of colour into garden Roses, and striking also for its enormous fruits.

A very promising shrub is *Cercis racemosa*, an ally of the Judas-tree, but bearing its flowers in short racemes, instead of in the close clusters seen on the Judas-tree. Unfortunately, it is very rare at present. We have it at Kew, but not on its own roots; indeed, I know of only three or four plants raised from seed. It can be distinguished from all other species of *Cercis*, even when out of flower, by the very downy leaves and young shoots.

After Rhododendron, no genus of shrubs has been more enhanced in garden value by WILSON'S work than *Berberis*. The first species to make its mark in gardens was the one named after the collector's wife, *Berberis Wilsonae*. It has proved to be the type and forerunner

of a distinct and handsome group, the leading characteristics of which are small, dull grey-green leaves, pale yellow flowers, and red (usually coral-red) fruits. So far as one can tell at present, none is finer than *B. Wilsonae* itself, with its neat habit, its profusion of berries, and the beauty of its autumn tints. But the others, like *subcaulialata* and *Stapfiana*, are of taller, more graceful growth, and *subcaulialata* especially is valuable for retaining its fruits in high colour until November and December. *Berberis Prattii*, *B. polyantha*, and *B. brevipaniculata* are three closely allied species, of great beauty in flower and fruit. All these are deciduous.

Turning to evergreen Barberries, none is more interesting than *B. verruculosa*, a name that refers to the small warty excrescences on the twigs. This Barberry, with its dense, compact shape, its glittering black-green foliage, its large golden-yellow blossom and purple berries, is one of the most pleasing of dwarf evergreens.

Berberis Sargentiana is of taller, more vigorous growth, and belongs to the same section of Barberries as the Himalayan species, *Wallichiana* and *Hookeri*. I mention it as a very promising evergreen for the more inclement parts of our islands. In the winter of 1908-9, a very trying one in the south for evergreens, *Berberis Hookeri* and *Berberis Knightii* were killed back to ground level, but *B. Sargentiana* was quite unaffected. At the Arnold Arboretum in Massachusetts, where they have much greater winter cold than anything we ever experience, this Barberry has proved to be hardy, and the *only* hardy evergreen one. Two other species that look vigorous and promising are *B. levis* and *B. Gagnepainii*.

A wonderful crowd of Maples has been found in Western and Central China—too many, in fact, for the average garden to accommodate, but there are a few of more than ordinary interest. *Acer Davidii*, for instance, has its two-year and three-year old wood beautifully striped with blue-white lines, and promises to be as remarkable in this respect as *Acer pennsylvanicum*—the Moosewood of North America. *Acer griseum*, too, is very highly spoken of by WILSON. Its trunk peels like that of a Birch, revealing bark which when newly exposed is of a rich brownish red; the foliage also is said to turn a rich red before falling in autumn. Altogether, WILSON collected some forty species of Maple.

Of the Climbing Honeysuckles none is more beautiful than *Lonicera tragophylla*, but in my experience it does not thrive well in cultivation. Mr. WILSON told me he believed it disliked fierce sunshine, and would be found to succeed best in partial shade. It would be interesting to hear of other cultivators' experience in this matter.

Evergreen climbers are so scarce that *Lonicera Henryi* may prove useful in its vigorous growth, but it has not as yet shown any particularly striking qualities in flower or in fruit. Turning to the shrubby sorts, I think the best will prove to be *Lonicera Maackii* var. *podocarpa*, a vigorous bush, bearing its scented white and yellow



[Photo Wallis

FIG. 53 — *DEUTZIA VEITCHII*.

[To face p. 224.



FIG 54 —DIPELIA FLORIBUNDA.

[Photo Wallis.

[To face p. 225.

flowers in two rows on the horizontally spreading branchlets. *Lonicera nitida* is a very distinct evergreen, of dainty aspect, with tiny leaves. It has blue-purple fruits, but whether it will bear them freely with us remains to be seen.

[For permission to make sixteen of the thirty-one lantern-slides by which the lecture was illustrated, we have to express our obligations to Harvard University and Prof. C. S. Sargent. They were selected from the collections of photographs made by Mr. E. H. Wilson during his last two journeys in Western China.]

SOME GARDEN IRISES.

By W. R. DYKES, M.A.

[Read June 3, 1914; Professor F. KEEBLE, M.A., F.R.S., in the Chair.]

It would obviously be impossible in the short time at our disposal this afternoon to give anything approaching an adequate account of all the Irises that our gardens now contain. I propose, therefore, to deal primarily with certain groups of Irises among which confusion seems to prevail, and, as we pass from one group to another, to bring to your notice some of those Irises which are still rare in cultivation, either by reason of their recent introduction or from what appears to me to be unaccountable neglect. It may be that I have a quite unreasonable prejudice in their favour. I probably have.

The first Irises, then, to which I propose to draw your attention are the three which appeared in this Society's list of plants for distribution at the beginning of this year. They serve to illustrate the fact that gardeners have—and indeed must have—tenacious memories for names, though the mental processes by which the names have become attached to the plants will not always bear logical analysis.

The first of the three names on the list is that of *Iris germanica*. It may be a paradox, but the only two facts on which I feel justified in insisting with regard to this Iris are, firstly that it is not a native of Germany, and secondly that of the vast series of plants which we find under this heading in catalogues and garden lists only a very small proportion have anything whatever to do with Linnaeus' species, *I. germanica*.

Of all the twenty or thirty Irises known to Linnaeus this is perhaps the most difficult to identify. If we had only his short Latin diagnosis, we should be utterly unable to decide to which of a number of plants he gave the name. Fortunately he quotes his authorities, and by inquiring into the sources of his information, as well as by the process of eliminating those species of which his descriptions are more definite and adequate, it is possible to arrive at a definition of *I. germanica*. This can be checked by comparison with the dried specimen which is still preserved in his herbarium at the Linnean Society here in London. Of colour there is of course no longer any trace, and, since such words as purple, lavender, lilac, and violet convey such very different impressions to different individuals, we cannot be certain which of several colour-forms Linnaeus had in mind.

We may, however, define *I. germanica* as a rhizomatous, bearded species, with a branching stem, which in its typical form seems to produce four flowers, though a fifth may often develop immediately

below the terminal head of two flowers. Apart from the inflorescence, the characteristic features seem to be the spathe-valves, which are half scarious at flowering time; the presence, usual but not invariable, of scattered hairs at the base of the standards on the inner side, the sharply three-sided capsule, the oval or pear-shaped and not compressed seeds, and the length of the perianth-tube, which measures about an inch. Lastly, and this is a feature to which I would specially draw your attention, this Iris is evergreen or practically so. It does not wait until after the turn of the year before pushing up its new growths. These develop rapidly during the autumn rains, and in mid-winter *I. germanica* is at once noticeable among its relatives in any collection of Irises.

It is precisely this characteristic habit of leaf-growth that shows us that the plant cannot be a native of Germany, or indeed of any part of Central Europe. If you search in winter for *I. aphylla* (forgetting for the moment that its very name means leafless) or for *I. sibirica*, *graminea*, *pumila*, or *variegata*, all of which are undoubtedly natives of Central Europe, you will have some difficulty in seeing even the merest tips of the leaves above the surface of the soil. All are adapted to resist the rigours of the Continental winters, and have learnt to restrain their energies in the direction of leaf-production until the worst of the weather is over and spring is at hand.

Here it may be well to digress for a moment to notice the confusion in our gardens between *I. pumila* and *I. chamaeiris*. The former is comparatively rare, but may be known at once by being leafless in winter, by the almost complete absence of stem, and by the long perianth-tube. It is a native of Austria and Hungary, and stretches round the north side of the Black Sea to the Caucasus, all districts with rigorous winters. *I. chamaeiris*, on the other hand, starts into growth, just as does *I. germanica*, in autumn, and it is no surprise to find that it is confined to the South of France and to Northern Italy, where the winters are comparatively mild. It should be readily distinguished from *I. pumila* by its habit of growth, by its stem and by its relatively short tube. We may notice, too, that the only known Iris from Arabia, namely *I. Madonna*, and its albino form *I. albicans*, both retain their leaves in winter just as does *I. germanica*.

If we compare the growth and habits of *I. germanica* with those of the species already mentioned, we shall be forced to the conclusion that *I. germanica* is a native of Southern Europe or of some part of the Mediterranean basin. The question of its origin is indeed complicated by the fact that the form which we know as *atropurpurea*, or 'Purple King,' was described as *I. nepalensis* by Wallich, and is in cultivation in Nepal, while the well-known variety 'Kharput,' which Foster received from the town of that name in Asia Minor, has long been naturalized near Srinagar in Kashmir. It also, curiously enough, decorates the Guards' Monument at Sebastopol, and only last year I found that it is the common form of *I. germanica* at Mostar in Herzegovina. That *I. germanica* could have an Indian origin

would seem to be very improbable, since such undoubtedly native species as the real *I. nepalensis* of Don and *I. kumaonensis* lie entirely dormant for several months in winter and even until late in spring, as indeed the climatic conditions would lead us to expect.

A consequence of this southern origin of *I. germanica* is that it is not absolutely hardy here in England. Complaints that 'Purple King' flowers but shyly are often due to the fact that the late spring frosts destroy the embryo inflorescences before they have emerged from the leaves. The brown decaying remains can be found by dissection enclosed in the tufts of leaves, although it is but poor consolation to have our theory of the origin of the plant confirmed in this negative fashion.

Still more important for our purpose is the further consequence that it is extremely rare that any form of *I. germanica* ripens sound seed in England, or, indeed, as far as I can gather, in Germany, or even in the South of France. *I. aphylla*, *I. variegata*, and *I. pallida*, on the other hand, all mature seeds readily, and this fact, together with the results of raising a number of seedlings from them, confirms me in the belief that our common garden hybrids are to be traced, not to *I. germanica*, but rather to *I. variegata*, from which they certainly derive their yellow tints, and to *I. pallida*, with its more complicated inflorescence.

We may notice in passing that the names '*squalens*' and '*sambucina*,' in all probability, only denote two of the almost innumerable hybrids of *I. variegata* and *I. pallida* and have themselves no specific value, although the name *squalens* may serve as a useful label to denote those plants in which the yellow of *variegata* and the blue-purple of the other parent struggle for the mastery and produce shades of colour which may well be called muddy or squalid.

Since these notes were written on a winter evening, when time was a little less scarce than it is at this time of the year, the flowering of some plants which I found last year on the Dalmatian coast has afforded striking confirmation of this theory of the origin of our garden hybrids, misnamed German Irises.

A few years ago there was discovered on the top of a mountain some 4000 feet high in the Velebit range in Croatia, within a mile or two of the coast as the crow flies, an Iris which I did not recognize when Dr. DEGEN, of Budapest, was so good as to send me dried specimens. It appeared to be either a yellow form of *I. aphylla* or some new species. By the kindness of the late Herr DOBIASCH, of Zengg, who provided me with a native guide and to whose memory I wish to take this opportunity of paying tribute, I was able in April 1913 to see this Iris in its native home. It was a stiff climb up from the coast over the roughest and steepest of limestone hills. As I had been travelling all night by somewhat primitive means of conveyance, and as it was pouring with rain, I was beginning to wonder as we neared the top whether it was worth while to persevere, when I was cheered by the sight of a few Iris leaves among the rough limestone of the

slope that faced the Adriatic and the island of Pago. My guide urged that it was not worth while to stop to collect any of these plants, as we were close to the cup-shaped hollow near the summit where the Iris of which I was in search was known to grow. However, I dug up a few of them and am now very glad that I stopped to do so, for they have turned out to be a small *pallida* of the same description as those which were first described as *I. illyrica*, to which the well-known *I. Cengialti* is closely allied, if indeed, as I am inclined to think, the one is not merely a local form of the other.

On reaching the hollow for which I was bound, I was rewarded by the sight of flowers on all sides; patches of *Gentiana tergestina*, which is closely allied to *G. verna*, a yellow *Primula*, Crocuses of a species which has not yet been determined, varying in all shades of colour from white to purple, and coming up through the Gentians and among the Crocuses the short immature leaves of an Iris. The soil was a black, almost peaty vegetable mould, very different from the scanty but strong reddish soil, familiar to all those who have dug plants out of the limestone hills of Southern Europe. Snow was still lying in patches, and no signs of flower-stems had yet developed on the Irises. However, I brought home a number of plants for my garden and for that of a friend for whom I was also collecting. In May of this year they have flowered freely.

These plants from the hollow at the top comprise at least two Irises, namely *I. variegata* with pure light yellow standards and red-brown veins on the falls, and another which is obviously a natural hybrid between *I. variegata* and the *I. illyrica* which has just been mentioned as growing in the immediate vicinity. The latter, being a *pallida*, has spathe-valves that are wholly dry and scarious at flowering time; those of *I. variegata* are entirely green, while those of the hybrid are green at the base and scarious in the upper part. The latter is identical with those numerous hybrids which have long been common in gardens under the names of *squalens* and *sambucina*.

Of the newer hybrids I cannot too strongly recommend, as good border Irises, 'Iriskönig,' the best of the *variegatae*; 'Oriflamme,' which is nearly a pure *germanica* and an improvement on *macrantha*; 'Black Prince,' which is specially valuable for its deep velvety flowers and for its late-flowering habit; and 'Isoline,' of which I suspect one parent to have been *I. trojana*. To those who wish to raise hybrids I would specially recommend the latter, for it has already given me one seedling which produced a spike containing no less than fifteen flowers.

Other pleasing hybrids may easily be raised by crossing *I. pallida* with pollen of *I. Cengialti* and of its variety 'Loppio.' The resultant plants mostly give us clear blue shades of purple with the habit of a smallish *pallida*, not infrequently with the addition of a deep golden beard, which sets off a strikingly handsome flower.

We will now pass on to the second Iris on the list, which appears

as *I. laevigata* syn. *I. Kaempferi*. These two names have long been in horticultural use, but their association only serves to perpetuate an obvious confusion. One would have thought that even the most rapid consideration of the common Japanese Irises would have driven us to question the suitability of the name *laevigata*, which means "smoothed." Their leaves are rough, with a prominent central rib; the seeds are wrinkled, the petals crimped, and indeed it is hard to see what feature could possibly have suggested the name.

Like several other plants which we associate with Japan, such as *I. japonica*, which comes from the hills near Ichang in Central China, *I. Kaempferi* is a native of China and grows wild in the marshes along the Amur. In its natural state it appears to be always single, and there is no accepted explanation of the means by which the Japanese have evolved from it the long series of double, distorted and even bloated hybrids with which the student of Japanese art has long been familiar. In the natural state the colour is a deep red-purple, though albino forms most undoubtedly occur. In the famous ditch which runs through the lower corner of the Wisley garden, *I. Kaempferi* has now been growing for many years since WILSON first planted there importations from Japan. Innumerable seedlings must have grown up there in the course of time, and it is interesting to notice that the self-sown reversions to the single wild form of a uniform red-purple or white now far outnumber all the other forms to be found scattered among them.

I. laevigata is also a native of the Amur marshes and may be easily distinguished by its foliage, which is smooth and has no prominent central rib, and by its large smooth polished seeds, which closely resemble those of our native yellow water Iris, *I. Pseudacorus*. The colour is purple, usually of a blue, but sometimes of a red, shade, with a narrow central streak of yellowish white. Good forms of this species are, I think, undoubtedly among the finest blue Irises that we possess.

Curiously enough, this Iris also first reached us from Japan in the form of a quasi-albino variety, which came to Kew mixed with *I. Kaempferi*, and which was separated by Mr. Baker and described as *I. albopurpurea*. We must accordingly reduce this name to *I. laevigata* var. *albopurpurea* and try to realize that the two names *laevigata* and *Kaempferi* represent two totally different species. Among collected material now preserved in herbaria I have found no evidence that natural hybrids of these two species occur, and efforts to cross them in the garden have so far proved futile, though I should be the last to attach any great value to such purely negative evidence. Of the conditions that determine the fertility of an Iris little is yet known, and, after succeeding quite unexpectedly in crossing a bearded Pogoniris with a crested Evansia, although many previous efforts had always resulted in failure, I am inclined to think that it may not be impossible to cross any two members of the genus.

In this connexion, may I suggest to the hybridizer the interest

that would attach to a hybrid between a bulbous and a non-bulbous species? Unless outward appearances are very deceptive, I am inclined to think that the point of contact, and consequently the greatest hope of success, lies in the neighbourhood of *I. Xiphium* and *I. spuria*. The flowers of these two species are curiously similar in shape, and we must also remember that the former sometimes, though rarely, produces one or two vertical lateral branches in the axils of the leaves precisely similar to those that we find in *I. spuria*. They are also still to be found growing wild in the same region, for they both occur in Spain and in North-west Africa. Moreover, *I. Xiphium* has been recently rediscovered on the French coast between Marseilles and the Spanish frontier, where *I. spuria* is also not unknown.

If repeated attempts are made to cross these two species, sooner or later one may succeed, and the interest will then be to see what kind of rootstock the plant will form. The resultant plant might perhaps throw some light on the question whether the bulb arose from the rhizome or the rhizome from the bulb, or whether both have been evolved from a common ancestor.

We must now pass on to the third name on our list, namely *I. sibirica orientalis*, which may perhaps have been intentionally compounded to describe a hybrid between two species, for *I. sibirica* and *I. orientalis* are totally distinct. The former is, I believe, confined to Europe east of the Urals, between which and Lake Baikal there occurs a gap before *I. orientalis* begins in North-eastern Asia. I must admit in passing that there is apparently in Corea a puzzling plant which seems in some dried specimens to be merely *I. orientalis*, but which in other cases comes very near to being a dwarf, large-flowered *sibirica*. I live in hopes of eventually obtaining seed of wild plants of this Corean Iris, for I have always had some doubt about the authenticity of reputed specimens from Corea which I have grown from time to time.

I. sibirica and *I. orientalis* are totally distinct in habit, and, what is even more important, have entirely dissimilar seeds and seed-vessels. Both have hollow stems, and narrow, almost grassy, foliage. Here, however, the likeness ends, for the spathes of *sibirica* are entirely scariosus, while those of *orientalis* are wholly herbaceous. The capsule of *sibirica* is broad, rounded and inflated, and the seeds large and flattened, while in the case of *I. orientalis* the capsule is much narrower relatively to its length and the seeds are much smaller, with a tendency to be cubical.

Of both species allinos are common, and the well-known and beautiful 'Snow Queen' is a typical albino form of *I. orientalis*. It breeds true to the white colour, which acts as a Mendelian recessive.

The rehabilitation of THUNBERG'S *I. orientalis* as a good species is fortunately rendered possible by the evident confusion that underlies MILLER'S Iris of that name. The latter is said to be bearded, and yet the figure is that of some member of the *spuria* group. In view of this confusion in the original description we are able to keep

THUNBERG's name of *I. orientalis* for the relative of *I. sibirica*, and also to restore to a well-known and stately garden plant the appropriate name of *ochroleuca*.

Both *I. sibirica* and *I. orientalis* have great possibilities for the raiser of seedlings. Some of these are more floriferous and vigorous than others and the shade of blue in the flowers is also apt to vary. The finest sky-blue shades may be obtained by crossing *I. orientalis* with its albino forms, while the stature and habit of *I. sibirica* may be combined by hybridization with the larger flowers of *I. orientalis*.

With the recent introduction of two yellow-flowered relatives from Western China, *I. Wilsoni* and *I. Forrestii*, the possibilities are still further increased, and I have already obtained some very pleasing results, in one of which the yellow of *I. Wilsoni* is distinctly visible at the base of all the segments of a pale blue flower.

It is impossible to pass from the *sibirica* group without mentioning what is perhaps the finest plant of all, namely *I. chrysographes*, to my mind one of the best of the many beautiful Chinese plants we owe to Mr. E. H. WILSON. In its best forms it is really magnificent, and I shall never forget the experience of watching the first flower unfold, and of seeing for the first time the brilliant golden markings on the rich velvety deep purple violet falls.

Before I conclude these notes may I venture to put before you a point which I had hoped to be able to illustrate to you more fully from living specimens? It concerns a confusion which has arisen around the name of *I. filifolia*. The true plant is still rare, though I hope that several hundred seedlings which I have raised will soon have all reached flowering size. The plant is found in North-west Africa and in Southern Spain, and I considered myself very lucky when I obtained a few bulbs and some seeds through the kindness of a friend at Gibraltar, who, owing to his official position, was able to obtain them for me from a station near the top of the rock, where it grows in almost inaccessible places in a part to which visitors are not admitted. The colour is a rich red-purple with a central yellow blotch, round which the juxtaposition of the purple and yellow produces a kind of bluish halo. What I particularly want to point out is that a large and early form of *I. Xiphium*, which the trade dealers have put in their lists for years as *I. filifolia*, has nothing whatever to do with that species. The difference is at once apparent in the long slender perianth-tube of *I. filifolia*, the false plant having only the short funnel-shaped tube of *I. Xiphium*.

Those with whom Spanish Irises succeed cannot do better than obtain a supply of the *pseudo-filifolia*, which might be more appropriately known as *I. Xiphium* var. *praecox*, from its early-flowering habit, and cross the flowers with pollen of the best of the older Spanish Irises from which early blooms have been obtained under glass. The result will be a series of large-flowered forms, similar to, and I believe identical with, those which have been introduced under the name of Dutch Irises during the last few years.

Those whose gardens are sufficiently warm and sheltered to be able to flower *I. tingitana* might use this to obtain an even finer series, for the few known hybrids of this magnificent Iris with *I. Xiphium* have the size and brilliance of *I. tingitana* and almost the hardiness of the other parent. It is interesting to note, too, that the long perianth-tube of *I. tingitana* is neither dominant nor recessive, in Mendelian phraseology, for the resultant hybrids have a short linear tube and so stand half-way in this respect between *I. tingitana* and *I. Xiphium*. At the same time the flowers closely resemble those of *I. tingitana* while the plants are as early as that species, hardier and more floriferous.

In conclusion, may I ask your pardon for leading you into much dry detail? My only excuse is that to me, at any rate, my flowers have become the more interesting the more closely I have examined them, and the more searching the inquiry I have tried to make into their origin and history.

THE VELTHEIMIAS.

By A. WORSLEY, F.R.H.S.

THIS small genus * of bulbous Liliaceous plants has been cultivated in Britain for nearly 150 years, but is now seldom seen outside botanic gardens. It has been described and figured in many books, and there is nothing to be gained by redescribing it now, but the following notes fill up certain gaps in older descriptions.

I have cultivated two species of this genus for twenty years, and have twice imported them direct from South Africa in some quantity. They flourish in any airy greenhouse from which the frost is excluded, and do very well in old lofty conservatories, but their growth should on no account be hurried on by heat.

They may not improbably prove hardy in special positions, and newly imported bulbs make good "dot" plants among summer beds of succulents. I can find no record of any garden forms of this genus. Some forms of *Veltheimia glauca* are very beautiful foliage plants where they are well grown, but this species does not succeed in most gardens, although it will linger on for many years.

V. viridifolia is, on the other hand, easy to grow, and flourishes with the Nerines in autumn and winter. As the flowers do not generally develop until the spring, the after-treatment must vary, but a period of at least two months' dry rest is necessary after the foliage dies. Although the inflorescence is not very showy, it lasts a long time, and the beauty of the shining intense-green leaves and their symmetrical growth make this plant generally admired.

I generally grow my plants in nine-inch pots, and have made the following notes on a recent importation of this species from South Africa.

Bulb—conical, with no neck. *Leaves*—generally 8 (up to 10), spreading, undulated, fleshy, deep shining green.† From less than a foot to 1½ foot long by from 4 inches to nearly 6 inches wide. *Scape*—from less than 2 feet up to 2½ feet high, mottled purple and green. The dense terminal many-flowered spike 4 or 5 inches long.

* Containing perhaps three species, of which two are in cultivation in Britain.

I. *V. glauca* Jacquin, *Hort. Schæn.* i. 40, t. 77; *Bot. Mag.* t. 3456. Flowers red or yellow, foliage very glaucous. South African coasts and Little Namaqualand.

II. *V. viridiflora* Jacquin, *Hort. Schæn.* i. 41, t. 78; *Bot. Mag.* t. 501. Flowers red, pink, or yellow. South African coasts.

III. *V. bracteata* Harvey ex Baker, in *Journ. Linn. Soc.* xi. (1871), 411. Flowers yellow. Coastal region. British Kaffraria. Not in cultivation.

V. intermedia Sweet is a name only.

† In some forms this "varnished" appearance of the foliage is very remarkable.

Bracts—equal in length to the limb of the flowers, or, in some forms, much shorter than the limb. *Flowers*—scentless, shortly pedicellate, tubular-campanulate, subnutant, $1\frac{3}{4}$ inch long by $\frac{1}{2}$ inch span, flushed and mottled with pink (varying to rosy-red) externally and internally. Segments equal, $\frac{1}{8}$ inch long. *Tube*—dilated half-way at the place where the stamens become free, and twice as wide in the upper half as in the lower half. *Stamens*—exserted, of unequal lengths, connivent. Free ends bright purple. *Anthers*—erect. Pollen yellow. *Ovary*— $\frac{5}{8}$ inch long. *Ovules*—two pairs in a bunch at the middle of the placenta. *Style*—equal to limb. *Stigma*—entire. *Fruit*—papyriforous, containing a single, round, black, seed.*

These plants are larger in all respects than those described in Nicholson's "Dictionary of Gardening" and in the "Flora Capensis," and have leaves double the width of the type specimens. I have never seen the yellowish-flowered forms described. The length of the bracts seems inconstant, although this character has been used as a sectional distinction in the "Flora Capensis."

* Seeds raised at Isleworth on three plants have germinated.

THE SOUTH AFRICAN GERBERAS.

By R. A. DÜMMER, F.R.H.S.

THE genus *Gerbera** of the family Compositae was founded by the pre-Linnean botanist GRONOVIVS in 1737, and commemorates the two German brothers GERBER—FR. GERBER, who collected plants in the West Indies, and TRAUG. GERBER, who in 1732, at the command of the KAISERIN ANNA, travelled in Russia, Siberia, and Tartary in search of plants.

The group as at present conceived comprises approximately forty-five species, of which twenty-five are scattered throughout South Africa, especially in the coastal districts of Cape Colony, extending from the south-western districts from the Cape Peninsula eastwards up to Natal, and from thence inland into the drier districts of the Kalahari Region, where in their respective seasons they considerably enhance the beauty of the vegetation.

Of the remaining species, three occur on the adjacent island of Madagascar, including the ubiquitous and widespread *G. piloselloides*, three to Tropical Africa (the latter probably representing geographical forms of the South African species or vice versa), four to North Africa and the Orient,† while the more temperate zones of India, with their five, are followed by China with its eight species, one of which, a very distinct plant, has recently been described in the *Gardeners' Chronicle*, viz. *G. hederacfolia*, mihi. The Gerberas of the Cape Peninsula are invariably found on the mountain slopes, principally of the Table Mountain range, from sea-level up to elevations of about 1500 feet among the "grassy" Restiaceous element, which is so characteristic though mournful an ecological feature of these regions. Some luxuriate in the crevices of outcrops of granite or the geological formation known as the Table Mountain sandstone, a sandstone of reddish hue; others prefer more open and sandy situations, sand of a loose white coarse-grained matrix, which also covers extensive tracts of the low-lying flats in which many of the indigenous terrestrial Orchids, Iridaceous plants, &c., revel.

Their preference for the geological formation under consideration is further evinced by their greater abundance in the coastal districts which are traversed by this particular formation, and their absence or rarity where it vanishes. The species nowhere appear to occur in such abundance as to characterize the vegetation, but the extremely

* *Gerbera* = *Gerberia*, *Atasites*, *Idicium*, *Aphyllocaulon*, *Oreoseris*, *Berniera*, *Chaptalia*, *Cleistanthium*, *Epiclinastrum*, *Lastopus*, *Leibnitzia*, *Leptica*, *Anandria*, and *Uechtrizia* of other authors.

† *Uechtrizia armena*, Freyn = *Gerbera armena*, Dümmer, comb. nov.

small range of certain species, such as *G. asplenifolia*, *G. Wrightii*, and *G. integræ*, is significant, and may serve partly to explain their neglect culturally. Despite their claim to an extended cultivation, only two species have gained a hold on popular esteem—namely, *G. aurantiaca* (*G. Elsæ* Hort.) and the Barberton Daisy *G. Jamesonii*, and its varieties and hybrids. In MILLER's time, three of the South African species were in cultivation—namely, *G. asplenifolia*, *G. Burmannii*, and *G. piloselloides*; but these evidently disappeared subsequently, for neither LOUDON nor AITON allude to them, and they appear to be entirely lost to cultivation now. The disappearance of the last is not to be regretted, for it has little pretence to beauty. The remarkable results following from the extended cultivation and judicious hybridization of the Barberton Daisy suggest the trial of others, of which the writer confidently recommends the introduction of *G. asplenifolia*, *G. integræ*, *G. Wrightii*, *G. Burmannii*, and the varieties of *G. aurantiaca*.

The following descriptions of the recognized species are based upon material in the Kew Herbarium, and references to the synonyms are included as well, besides collectors' numbers, which are, moreover, usually indicative of the time of flowering of the respective species in the wild state, and suggest incidentally the area of distribution of each as is at present known.

GERBFRA ASPLENIFOLIA, *Sprengel, Syst. Veg.* iii. 576 (1826); *De Candolle Prod.* vii. 15 (1838); *Harvey in Harv. & Sond. Fl. Cap.* iii. 520 (1865); *Nicholson Dict. Gard.* v. 389.

Syn. Arnica *Gerbera*, *Linn. Sp. Pl.* 885 (1753) *non Burmann*; *Thunberg, Fl. Cap.* 669 (1823).

Doronicum asplenifolium, *Lamarck Encyc.* ii. 315, t. 679, f. 5 (1786).

Gerbera coronopifolia, *Sprengel, l.c.*

G. (Gerberia) Linnaei, *Cassini in Dict. Sci. Nat.* xviii. 460 (1820).

G. coronopifolia, *Cass. l.c.* 461.

G. Lagascae, *Cass. l.c.* 462?

G. Gerbera, *O. Kuntze, Rev. Gen.* III. ii. 149.

G. asplenifolia var. Buxbaumii, *De Candolle, l.c.*

Leaves tufted, six to twenty, borne on short sheathing ventrally grooved white-tomentose or basally cobwebby petioles, rigid and erect, rarely spreading or arcuate, linear-lanceolate, pinnatifid or pinnatisect. 3-8 inches long, $\frac{1}{4}$ - $\frac{3}{4}$ inch broad, terminated by a triangular or sagittate lobe, thick, leathery, dark glossy green above (occasionally a few scattered silken hairs on the midrib), closely white-felted below, the lobes convex above, almost obliquely quadrate or rounded, decreasing in size towards the leaf-base and -apex, deflected, with their margins well recurved and often wavy. Scape solitary or two to three to a plant, 5-16 inches long, stout, terete, clothed with a more or less thick close deciduous felt, invested with small appressed

or spreading brownish subulate glabrous bracts at intervals $\frac{1}{4}$ – $\frac{1}{2}$ inch long, which are more crowded near the flower-head, gradually merging into the lanceolate or narrowly oblong acute or acuminate penninerved $\frac{1}{4}$ – $\frac{3}{4}$ inch long glabrous scales, which constitute the involucre; capitula when expanded $1\frac{1}{2}$ –3 inches across, ray-florets $\frac{1}{3}$ – $\frac{1}{2}$ inch broad, pure white above, pale rose or ruby-red beneath, obtusely 3-toothed at their apices.

Distribution. Coast Region. Cape Div.: *Villett*! *Bowie*! on the Table Mountain slopes near Stinkwater, *Dümmer*! Devil's Peak, 1000 feet, *Bolus*! 1000 feet, Nov. 1908, *Dümmer*, 2036! Simon's Bay (1852), *Milne*! *Wright*! Stellenbosch Div.: Hottentot's Holland Mountains, 2000–3000 feet, Oct. *Mund*, 66! Caledon Div.: Nieuwe Kloof, Houw Hoek Mountains, March 16, 1815, *Burchell*, 8053! between Donker Hoek and Houw Hoek Mountains, March 10, 1815, *Burchell*, 8022! on a mountain near Genadendal, April 12, 1811, *Burchell*, 8639! Mountains of Baviaan's Kloof near Genadendal, Feb. 15, 1815, *Burchell*, 7625! on hills near Palmiet River, 1000 feet, Dec. 1877, *Bolus*, 4148! Caledon Baths, *Ecklon* and *Zeyher*! *Pappe*!

G. asplenifolia is undoubtedly unique among Gerberas, combining the superficies of a fern vegetatively with that of a Composite. So extraordinarily similar are the leaves of this plant to those of a simple-leaved *Asplenium* that the tyro, not noticing the method of their unfolding, is often beguiled by flowerless specimens and mistakes them for ferns. The species has a circumscribed distribution in the colony, and is confined to its south-western strip, including the Caledon, Stellenbosch, and Cape Districts, and is moreover extremely local. In the latter district, on the Cape Peninsula, it favours the slopes of Devil's Peak above Cape Town at elevations of about 1000 feet above sea-level, revelling in the crannies of outcrops of granite or Table Mountain sandstone, but flowering rarely, though floriferousness is occasionally induced by the effects of bush fires.

It is of rare occurrence on the slopes of Table Mountain facing the city, but is local on the western, above Camp's Bay at 500 feet, where, associated with the Restiaceous and Proteaceous element, it affords a typically Cape plant-association. On the eastern slopes it occurs at various points along the mountain range, and extends beyond to the Simon's Town Mountains.

Despite the extreme interest of the plant, and the elegance and beauty of the flower-heads which occasionally measure over 3 inches across, and are pure white above, pale rose or ruby-red below, the species does not appear to have found its way into English cultivation, and this is the more deplorable as it would assuredly afford interesting material for hybridization experiments with such species as *G. Jamesonii* or *G. aurantiaca*.

It is extremely probable that the plant was introduced in the living state to the Continent by the earlier Dutch travellers, for it is figured in BUXBAUM'S *Centuria Plantarum* as early as 1728, and

he calls it *Doronicum Africanum folio Asplenii*. Subsequently BURMANN depicted it in his *Rare African Plants* (1738), and it is alluded to by PETIVER and the pre-Linnean writers, PLUKENET, BREYN, SEBA, and others.

Curiously all the figures of the species are in the continental literature, except Plukenet's, which is however flowerless and therefore open to doubt.

GERBERA FERRUGINEA, *De Candolle Prod.* vii. 15 (1838).

Syn. *Doronicum asplenifolium* var. β , *Lamarck Dict.* ii. 315 (1786).

Arnica serrata, *Thunberg Prod.* 154 (1800); *Fl. Cap.* 669 (1823).

Gerbera sinuata, *Lessing in Linnaea*, v. 292 (1830), non *Sprengel*.

Arnica Gerbera, *Burmman ex De Candolle*, l.c. non *Linneus*.

A. *Gerbera* var. α *E. Meyer in Drège Zwei Pfl. Doc.* 187 (1843); *Harvey*, l.c. 520.

Leaves in tufts of three to twelve, ascending or spreading, borne on slender ventrally grooved dorsally convex brownish petioles $\frac{1}{2}$ –3 inches long, which are invariably glabrous towards the upper end, and white felted or cobwebby at their broadened sheathing base; leaf-blade oblong or narrowly oblong, broadly subacute at the apex, truncate or obliquely truncate or wedge-shaped at the base, $1\frac{1}{2}$ –4 inches long, $\frac{1}{4}$ –1 inch broad, leathery, dark lustrous green above with a sunken midrib, closely white or rusty-felted and dull below, the midrib raised, the lateral nerves distant, eventually coalescing towards the margin and forming a subintramarginal band; margin subsinuate and slightly revolute, distantly and shallowly acutely or obtusely toothed, the teeth often pointing downwards. Scape solitary, rarely three, slender, 5–15 inches long, almost terete, velvety pubescent above the middle, chestnut-brown and occasionally glabrescent towards the base, the bracts as in *G. asplenifolia*, but slightly larger towards the base of the scape. Involucral bracts as in the latter species, but fewer-seriate and slightly pubescent. Flower-head $1\frac{1}{4}$ –2 inches in diameter, the ray-florets snow-white within, purple without, slightly narrower than in *G. asplenifolia*, 2–3-toothed apically, disc-florets brownish. Pappus pale brownish.

Distribution. Coast Region. Riversdale Div.: between Little Vet River and Garcias Pass, Nov. 27, 1814, *Burchell*, 6908! Mossel Bay Div.: Driefontein at Mossel Bay, below 500 feet, Aug., *Drège*! George Div.: rocky hill near the west end of Lange Vallei, Aug. 18, 1814, *Burchell*, 5701! Knysna Div.: near Knysna, June 29, 1814, *Burchell*, 5506! Uniondale Div.: near the Keurboom's River, Mantis Station and Cloete's Kraal, March 25, 1814, *Burchell*, 5139!

Var. linearis, *Dümmer*, comb. nov.

Syn. *Gerbera asplenifolia* var. *linearis*, *Harvey*, l.c. 520.

Leaves narrower than the type, linear, $1\frac{1}{4}$ – $3\frac{1}{4}$ inches long

(including the petiole), $\frac{1}{2}$ – $\frac{1}{3}$ inch broad, quite entire, or toothed as in the species.

Distribution. Coast Region: Swellendam, Voorman's Bosch, Zeyher, 3078, partly! Riversdale Div.: among bushes, mountain-slopes near Garcia's Pass, Sept. 1908, Phillips, 406! (the latter specimen is immature and hence its identification is subject to criticism). Knysna Div.: Knysna, Tyson, 2988, ex Phillips.

The scaly scapes of *G. ferruginea* proclaim the affinity of this species to the preceding, but their broader dentate leaves, and one, seriate involucre bracts, render the plant easy of identification. Its flower-heads are also smaller and generally average 2 inches across, their ray-florets being pure white above and purple without. The species has a more eastern distribution than *G. asplenifolia*, and extends from the Riversdale District along the coast eastwards as far as Uniondale, where at the latter place it was detected near the Kcur-booms River by the traveller BURCHELL. The variety differs in the narrower less-toothed leaves, and has a more circumscribed area of distribution.

GERBERA TOMENTOSA, *De Candolle Prod.* vii. 16 (1838); *E. Meyer*, l.c. 187; *Harvey*, l.c. 520.

Syn. Gerbera microcephala, *Lessing in Linnaea*, v. 293 (1830).

G. macrocephala, *Lessing ex De Candolle*, l.c.

G. tomentosa var. *elliptica*, *De Candolle*, l.c.

G. hirsuta, *Sprengel ex De Candolle*, l.c., non *Lessing*.

Leaves in tufts of three to seven, erect, ascending or arched-spreading, borne on stoutish flattened or almost terete thickly white-tomentose petioles, 1–3 inches long, leaf-blade elliptic, rounded or obtuse at apex, cordate or obliquely cordate at the base, $1\frac{1}{4}$ – $2\frac{1}{2}$ inches long, $\frac{3}{4}$ – $1\frac{1}{4}$ inch broad, thickly coriaceous, eventually glossy green and glabrous above, closely and densely yellowish-felted and with the midrib raised below; margin recurved, wavy, entire or obsoletely toothed and sinuate, the teeth obtuse and often pointing downwards. Scapes solitary, or two to three to a plant, slender, terete, thinly white-felted, nude, or with a few minute bracts. Involucre bracts 2–3-seriate, acuminate, brownish or blackish tipped, velvety dorsally. Flower-heads $1\frac{1}{4}$ – $2\frac{1}{2}$ inches across, the ray-florets ten to thirty-five, white above, reddish-purple below, toothed as in the preceding species. Pappus whitish or pale reddish.

Distribution. Coast Region. Stellenbosch Div.: Hottentot's Holland Mountains, *Ecklon* and *Zeyher ex Sonder*, l.c. Caledon Div.: Caledon, *Ecklon* and *Zeyher ex Sonder*, l.c. Tops of the mountains of Baviaan's Kloof, near Genadendal, Feb. 16, 1815, *Burchell*, 7687! Uniondale Div.: Langekloof, *Drège*. Uitenhage Div.: Vanstadensberg, 1000 feet, Jan. *MacOwan*, 1061!

Var. USTULATA, *De Candolle*, l.c.

Leaves oblong, cordate at the base, obtuse at the apex, 1– $3\frac{1}{2}$ inches

long, $\frac{3}{4}$ –1 $\frac{1}{2}$ inch wide, thickly coriaceous, more thickly felted below than in the type; margin obsoletely dentate. Involucral bracts obviously black-tipped.

Distribution. Coast Region. Worcester Div.: Dutoit's Kloof, 2000–3000 feet, Oct.–Jan., *Drège*! Caledon Div.: Zwartberg, *Zeyher*!

Var. POLYGLOSSA, *De Candolle*, l.c.

Syn. *Arnica cordata*, *E. Meyer ex De Candolle Prod.* vii. 16, non *Thunberg*.

Leaves oblong-elliptic, cordate or obliquely cordate at the base, 2–3 inches long, $\frac{3}{4}$ –1 $\frac{1}{2}$ inch broad.

Distribution. Coast Region. Worcester Div.: Dutoit's Kloof, 2000–3000 feet, Oct.–Jan., *Drège*!

G. tomentosa occupies a position intermediate between *G. asplenifolia* and *G. ferruginea*, but may invariably be distinguished by the extreme paucity or total absence of the scape-scales which characterize those two species. It is a variable plant difficult of systematic limitation, but *De Candolle* recognized two varieties which differ solely in leaf characters. As in the preceding species, the ray-florets are white above and reddish underneath. The distribution of the plant and its varieties is suggested by the collectors' citations.

GERBERA INTEGRALIS, *Sonder in Harv. & Sond. Fl. Cap.* iii. 520 (1865); *Bolus & Dod in Trans. Phil. Soc. S. Afr.* XIV. iii. 289 (1903).

Leaves tufted, nine to fifteen, wholly glabrous except for the sheathing white cobwebby petiolar base, ascending, rarely spreading, borne on a broadish and flattish yellowish dorsally slightly keeled or convex petiole $\frac{1}{2}$ –5 inches long; blade ovate-oblong, or ovate, obtuse or rounded, narrowing abruptly, then gradually into the petiole, $\frac{3}{4}$ –3 $\frac{1}{4}$ inches long, $\frac{1}{2}$ –1 $\frac{1}{2}$ inch broad, leathery, entirely glabrous, light lustrous green above, much paler and dull below, the midrib and its three to seven pairs of lateral veins most prominent on the lower surface; margin wavy, slightly revolute, entire or irregularly sinuate basally, or minutely toothed at distant and irregular intervals. Scapes solitary or in pairs, slender, 6–14 inches long, terete, longitudinally striate, brownish, glabrous, studded with small lanceolate-subulate bracts at intervals. Involucral bracts glabrous, 2–3-seriate, acute or acutely acuminate, subapically and dorsally keeled. Flower-heads averaging 1 $\frac{1}{2}$ –2 inches in diameter ray-florets white above, reddish beneath, 2–3-toothed apically. Pappus cream or pale brown.

Hab. Coast Region. Cape Div.: Cape Flats near Rondebosch, Dec. 14, 1810, *Burchell*, 219! Cape Flats, *Ecklon* and *Zeyher ex Harvey*; near Cape Town, *Harvey*! Table Mountain, Lower Plateau, Feb. 23, 1896, *Wolley Dod*, 874!

An exceedingly uncommon and moreover acceptable species, easily recognized from its allies by its wholly glabrous leaves. It is confined to the Cape Peninsula, where it was first detected near Rondebosch by BURCHELL and latterly by WOLLEY DOD on the Lower

Plateau of Table Mountain (about 1500 feet). Like *G. asplenifolia*, it is extremely local, flowering usually in February, its ray-florets being snow-white above, reddish below.

***Gerbera lanata*, Dümmer (comb. nov.).**

Syn. *Gerbera tomentosa* var. *lanata*, Harvey, l.c. 520.

In many respects similar to *G. tomentosa*, but differing in the more robust habit, densely white or pale brownish lanate petioles, lower leaf-surfaces, scapes and involucre. Leaves oblong or sub-elliptic-oblong, $1\frac{1}{2}$ – $3\frac{1}{2}$ inches long, $\frac{3}{4}$ – $1\frac{1}{4}$ inch broad, cordate at the base, obtuse or rounded at the apex, glossy green and glabrous above at maturity, densely lanate below, with the thickened midrib only visible towards the leaf-base; margin entire or obsoletely sinuate, thickened and slightly recurved. Scape solitary or in threes, stout, thickly lanate, up to 18 inches long, almost scaleless. Involucre densely lanate. Flower-head averaging 2 inches across. Pappus reddish towards the base.

Hab. Coast Region. Stellenbosch Div.; Hottentot's Holland Mountains, *Bowie*! *Zeyher*, 3077!

I can scarcely agree with HARVEY respecting the varietal nature of this plant with *G. tomentosa*; it has several characters which render it quite distinct from the latter and warrant it specific rank. The leaves are exceedingly thick in texture, light glossy green, and moreover glabrous at maturity above, densely and thickly white woolly below.

GERBERA WRIGHTII, Harvey in *Harv. & Sond. Fl. Cap.* iii. 521 (1865); *Bolus & Dod in Trans. Phil. Soc. South Africa*, XIV. iii. 289 (1903).

Leaves in tufts of three to twelve, slender-petioled, ascending or laxly spreading; petiole $1\frac{1}{2}$ –4 inches long, grooved ventrally, sparingly white-felted or eventually glabrous; blade oblong, oval, or almost quadrate or triangular, rounded at the apex, cordate or rarely truncate at the base, $1\frac{1}{2}$ – $3\frac{1}{2}$ inches long, $1\frac{1}{4}$ – $2\frac{1}{2}$ inches broad, leathery, dark glossy green, glabrous and prominently veined above, snow-white-felted beneath, with a broadish midrib; margin repando-denticulate, the teeth distant and obtuse. Scape solitary, or in twos or threes, stout, up to $1\frac{1}{2}$ foot long, covered sparingly with a deciduous white cobwebby tomentum, eventually glabrescent; bracts subulate, $\frac{1}{4}$ – $\frac{1}{2}$ inch long, disposed at intervals along the scape. Involucral bracts 3–5-seriate, slightly tomentose towards their bases, glabrous and ruby-red towards their acuminate extremities. Flower-head large, $1\frac{1}{2}$ to over 3 inches in diameter, the ray-florets twenty-five to forty, white above, reddish or purplish below. Pappus rufous.

Hab. Coast Region. Cape Div.; Cape Peninsula, *Admiral Sir F. Grey*! on stony and grassy slopes of the Muizenberg, 250 feet, Nov. 1886, *MacOwan*, 540! Slangkop, Sept. 26, 1897, *Wolley Dod*,

3260! Top of Red Hill, Oct. 4, 1896, *Wolley Dod*, 1800! Table Mountain, Lower Plateau, 1500 feet, Jan. 1908, *Dimmer*, 1010!

Undoubtedly one of the handsomest of the South African Gerberas, confined so far as is known to the Cape Peninsula. There it frequents the mountain slopes of Table Mountain to beyond the Simon's Town ranges at elevations of 200–1500 feet above sea level, favouring the crannies of rocks and preferring the white sandy soil so characteristic a feature of that region. The variable leaves, arranged in rosettes, are of a fine dark glossy green, from which arise the slender one-headed scapes bearing heads often exceeding 3 inches in diameter, and of a clear beautiful white.

The local nature of the species may account for its absence from cultivation, but it is a gem which the Gerbera specialist can scarcely afford to omit from his collection.

GERBERA LEUCOTHRIX, *Harvey*, l.c. 521.

Leaves oblong, cordate at the base, deeply inciso-sinuate and subdentate, with revolute margins, glabrous above, persistently reddish tomentose beneath. Scapes scaly, cobwebby or nude below, tomentose at the summit. Involucral scales 4–5-seriate, minutely tomentose or glabrate. Pappus white.

Gerbera leucothrix was discovered by the collectors ECKLON and ZEYHER at the Cape, but precisely where is not ascertainable. The plant is unknown to me, but HARVEY, basing his remarks upon a solitary specimen, opines that it probably represents a natural hybrid between *G. ferruginea*, of which it has the foliage and pubescence, and *G. Burmannii*, which it resembles in involucre and pappus.

GERBERA BURMANNI, *Cassini in Dict. Sci. Nat.* xviii. 461 (1820), as *Gerberia*; *Lessing in Linnaea*, v. 294 (1830); *De Candolle*, l.c. 16.

Syn. Arnica crocea, *Linn. Sp. Pl.* 885 (1753); *Thunb. Fl. Cap.* 668 (1823).

Doronicum pyrolaefolium, *Lamarck Dict.* ii. 315 (1786).

Tussilago pyrolaefolia, *Vaillant ex Lamarck*, l.c.

Arnica pyrolaefolia, *Persoon Syn.* ii. 454 (1807).

Gerbera Burmannii var. Burmanni, *Harvey*, l.c. 521.

Leaves in tufts of three to twelve, ascending or laxly spreading; petioles $\frac{1}{2}$ – $3\frac{1}{2}$ inches long, slender, grooved ventrally, thinly white-canescenscent, or eventually glabrescent or glabrous; always cobwebby at the base; leaf-blade elliptic, oblong or obovate, obtuse or rounded, wedge-shaped and entire at the base, $1\frac{1}{2}$ – $3\frac{1}{2}$ inches long, 1 – $1\frac{1}{2}$ inch broad, fine and leathery in texture, entirely glabrous, prominently nerved and reticulated on both surfaces, dark glossy green above, paler below; margin minutely or coarsely and distantly toothed, occasionally subsinuate. Scape solitary, in pairs or threes, slender, $\frac{1}{2}$ – $1\frac{1}{4}$ foot long, glabrous or glabrescent, the scape-scales subulate, $\frac{1}{4}$ – $\frac{1}{2}$ inch long, sparingly disposed. Involucral bracts, usually glabrous, purplish towards their narrowly acuminate extremities. Flower-head 1 – $2\frac{1}{2}$

inches across, the ray-florets concolorous, saffron-red on both sides. Pappus snowy-white.

Hab. Coast Region. Paarl Div.; Paarl Berg, 1000–2000 feet, Nov.–Dec., *Drège*! Cape Div.; Cape Peninsula, Cape Flats between Cape Town and Simon's Bay, July 25, 1815, *Burchell*, 8569! Caledon Div.; Nieuwe Kloof, Houw Hoek Mountains, March 10, 1815, *Burchell*, 8034! Zwartberg, *Pappe*!

Var. SINUATA, *Harvey*, l.c. 521.

Syn. *Arnica sinuata*, *Thunberg Prod.* 154 (1800); *Fl. Cap.* 669 (1823).

Gerbera sinuata, *Sprengel Syst.* iii. 576 (1826).

Leaves thinly white-canescens below; margin usually more irregularly toothed and occasionally almost runcinate. Scape and involucre scales usually thinly canescens, at times glabrous.

Hab. Coast Region. Cape Div.; Cape Peninsula, *Forster*! *Sieber*! *Harvey*! On mountains near Cape Town, Sept., Oct., *Mund*, 67! Table Mountain, 500–600 feet, Dec., *Pappe*! *Ecklon*! 600 feet, Nov. 1907, *Dümmer*, 896! Simon's Bay, and Table Mountain, *Milne*, 77! Dec. 1852, *MacGillivray*, 538! Vlaggeberg, Sept. 21, 1896, *Wolley Dod*, 1644! on grassy and stony slopes of the Muizenberg above False Bay, 800 feet, Nov. 1885, *MacOwan*, 524! Caledon Div.; in a valley of the Palmiet Rivier, 700 feet, Dec. 1879, *Bolus*, 2988!

G. Burmanni was figured by the pre-Linnean botanist BURMANN in his work on Rare African Plants as early as 1738, but it is highly doubtful whether the figure was based upon a living specimen. It seemingly has never been introduced to horticulture despite its claim, a claim which would be the more appreciated on seeing the plant in its native habitat on the slopes of Table Mountain, where its saffron-red flower-heads add colour to the mountain-sides towards Christmas-time, the height of summer. The species is less common than its variety, from which it is distinguished by the wholly glabrous leaves and their less toothed and lacerated margins.

GERBERA CORDATA, *Lessing in Linnaea*, v. 297 (1830); *De Candolle Prod.* vii. 16 (1838); *E. Meyer in Drège Zwei Pfl. Doc.* 187 (1843); *Harvey*, l.c. 521.

Syn. *Arnica cordata*, *Thunb. Prod.* 154 (1800), *non Walpers*; *Fl. Cap.* 628 (1823); *Persoon Syn.* 453, No. 7 non No. 18 (1807).

A. piloselloides, *Sprengel Syst. Veg.* iii. 568 (1826), *non Cassini*.

Leaves in tufts of three to seven, ascending or straggling; petioles very short and stout, or long and slender, densely white-tomentose, $\frac{1}{4}$ –10 inches long, broadening and sheathing at the thickly tomentose and cobwebby base; blade oblong-elliptic or oblong-ovate, obtuse, rounded and occasionally obsoletely apiculate, regularly or obliquely cordate at the base, 2–6 inches long, $1\frac{1}{2}$ – $3\frac{1}{2}$ inches broad, thin in texture, dull dark green above, with scattered appressed rufous hairs or eventually

glabrescent except for the sunken midrib and its three to ten pairs of lateral nerves, persistently white-felted below, the midrib and nerves correspondingly raised; margin entire or distantly denticulate, closely and shortly ciliate. Scapes solitary or in pairs, short and stout, or long and slender, 2–12 inches long, scaleless, covered with a brownish deciduous cobwebby tomentum. Involucral bracts 2-seriate, narrow acuminate, white tomentellous below, dark brownish tomentellous at the tips, rarely exceeding $\frac{1}{2}$ – $\frac{3}{4}$ inch in length. Flower-head small, $\frac{3}{4}$ –1 $\frac{1}{2}$ inch in diameter, the ray-florets sulphur-yellow, narrow, and slightly exceeding the longest involucral bracts. Pappus snow-white, rufous with age.

Hab. Coast Region. Knysna Div.; between the Keurbooms River and Bitou River, March 30–April 1, 1814, *Burchell*, 5206! 5220! 5262! near the Knysna River Ford (western side), July 12, 1814, *Burchell*, 5525! Uitenhage Div.; between Enon and the Zuureberg Range, Johannaskloof, 1000–2000 feet, Nov., *Drège*! Vanstaadens Mountains, *Zeyher*, 809! at and near Uitenhage, Nov. 13–Dec. 1, 1813, *Burchell*, 4249! Albany Div.; *Cooper*, 1554! Grahamstown, *Cooper*, 2568! in woods near Grahamstown, 2000 feet, June–July, *MacOwan*, 241! 352! Kaffraria, *Mrs. Barber*!

G. cordata, a more eastern species than the preceding, extending from the Knysna districts eastwards along the coast to Kaffraria, has little to recommend it from a horticultural standpoint, as the ray-florets are yellow and far too short, scarcely exceeding the involucral scales at times. In clearings of the Knysna forest it is, in conjunction with its congener *G. ferruginea* and the Bracken, one of the first plants to clothe the ground.

BURCHELL states that the ray-florets are white, and this is very likely, for many of the Gerberas appear to be extraordinarily variable in colour.

GERBERA PILOSELLOIDES, *Cassini Dict. Sc. Nat.* xviii. 461 (1820) as *Gerberia*; *De Candolle Prod.* vii. 16; *Harvey*, l.c. 522; *Hooker Fl. Brit. India*, III. ii. 389 (1881).

Syn. *Arnica piloselloides*, *Linn. Pl. Afr. Rar.* 22, n. 73 (1760); *Amoen. Acad.* vi. 103 (1789).

Doronicum piloselloides, *Lamarck Dict.* ii. 314 (1786).

Gerbera ovalifolia, *De Candolle Prod.* vii. 17 (1838).

Leptica ciliata, *E. Meyer ex De Candolle*, l.c.

Onoseris ovalifolia, *Wallich ex De Candolle*, l.c.

Gerbera Schimperii, *Schultz Bip. ex Hochstetter in Flora*, xxiv. (1841), i. intell. 27.

G. piloselloides var. concolor, *C. H. Schultz Bip. in Flora*, xxvii. 779 (1844).

G. humilis, *C. H. Schultz*, l.c.

G. amabilis, *Hance in Walpers Ann.* ii. 947 (1852).

Oreoseris ovalifolia, *Wallich ex Hooker*, l.c. 398.

Leptica sinuata, *E. Meyer ex Steud. Nom.* Ed. II. ii. 29.

Leaves in tufts of three to twelve, occasionally rosulate, more

frequently ascending or laxly spreading; leaves subsessile or borne on $\frac{1}{2}$ –4 inches long, white or cream-coloured hirsute petioles which merge into a broadened and sheathing densely white-cobwebby base; blade narrowly or broadly elliptic-oblong, obovate, or obovate-oblong, 1–7 inches long, $\frac{3}{4}$ –3 inches broad, subacute, obtuse, apiculate or rounded at the apex, regularly or obliquely attenuate at the base (rarely subcordate), thin-textured, with scattered deciduous appressed soft whitish hairs on the dark dull upper surface, more hairy beneath, especially at the midrib and its three to seven pairs of lateral nerves, but not felted; margin entire or obscurely and irregularly denticulate, closely and either long or short and softly setose. Scapes solitary, or in twos to sixes, ebracteate, closely and shortly white or cream shaggy-haired, stout or slender, somewhat thickened at the apex, 3 inches to over 1 foot long. Involucral bracts 2–4-seriate, narrowly acuminate, shaggy and silky haired. Flower-head small, $\frac{1}{2}$ –1 $\frac{1}{2}$ inch across, the ray-florets erect, narrow, yellow or pinkish, shorter or equalling or slightly exceeding the longest involucral bracts. Pappus rufous.

Distribution. Coast Region Cape Div.; Cape Peninsula; Devil's Peak, July 20, 1815, *Burchell*, 8477! 600 feet, May 1908, *Dümmmer*, 1379! vicinity of Cape Town, Jan. 3, 1811, *Burchell*, 504! Cape Flats, between Cape Town and Simon's Bay, July 25, 1815, *Burchell*, 8562! Table Mountain; eastern slopes, near Kirstenbosch, Feb. 3, 1896, *Wolley Dod*, 818! western and other slopes, *Sieber*! *Pappe*! hills west of Simon's Town, April 4, 1896, *Wolley Dod*, 1022! Uniondale Div.; Long Kloof, eastern end, between the sources of the Kromme River and Wagenbooms River, March 10, 1814, *Burchell*, 4893! Long Kloof, between Avontuur and the sources of the Keurbooms River, March 18, 1814, *Burchell*, 5054! Uitenhage Div.; on the Vanstaadensberg nearest to Gagebosch, Feb. 14, 1814, *Burchell*, 4731! on the sand-hills by the Zwartkops River, and on the hills of Adow, Aug., *Zeyher*, 9! Port Elizabeth Div.; between Drostly Farm and the Lead Mine (near Maitland River), Jan. 27, 1814, *Burchell*, 4480! Albany Div.; Grahamstown, Sept., *MacOwan*, 287! Stocken-stroom Div.; Katberg, 4000–5000 feet, Nov., *Drège*! Queenstown Div.; Hangklip Mountain, Queenstown, 5500 feet, Nov. 1893, *Galpin*, 1637! Komgha Div.; Bazeia, 2000–2500 feet, Nov., *Baur*, 374! British Kaffraria (1860), *Cooper*, 172!

Eastern Region. Tembuland; between Morley and the Umtata River, 1000–2000 feet, May, *Drège*! Natal, *Gerrard*, 1042! grassy slopes near Inanda, 1800 feet, Oct. and Nov. 1883, *Wood*, 179! 474! 1133! Van Reenen, 5000–6000 feet, Nov. 15, 1892, *Wood*, 4772! Pietermaritzburg, Oct. 1883, *Wilms*, 2077! Lourenzo Marques, 100 feet, Nov. 30, 1897, *Schlechter*, 11533!

Kalahari Region. Transvaal. Gold Fields, 1870, *Baines*! Modderfontein, Oct. 1900, *Conrath*, 538! Houtbosch, *Rehmann*, 6112! stony mountain slopes near the town Lydenburg, Sept. 1895, *Wilms*, 778! Orange River Colony, 1862, *Cooper*, 2569!

Var. DISCOLOR, *De Candolle Prod.* vii. 17 (1838); *C. H. Schultz in Flora*, xxvii. 779 (1844).

Syn. *Arnica nudiflora*, *Thunberg ex Harvey*, l.c.

Leaves white tomentose beneath.

Hab. Coast Region. Uitenhage Div.; Zureberg, *Thunberg!*
Drège. Wodehouse, Stormberg, Wolve Kop, Dec., *Burke* or *Zeyher!*

Var. transvaalensis, *Dümmer*, var. nov.*

Crown of rootstock copiously and long white-silky, some of the hairs nearly an inch long. Leaves narrower than the type and either lanceolate or oblanceolate, subacute, $2\frac{1}{2}$ –5 inches long, $\frac{1}{4}$ – $\frac{1}{2}$ inch broad, covered all over with a dense long softly hirsute white or creamy indumentum; lateral nerves not obvious; margin entire, densely and closely hirsute-ciliate. Florets pale pink, according to GALPIN; pappus whitish.

Kalahari Region. Transvaal. Grassy mountain-tops, 4500 feet. Moodies, near Barberton, Sept.–Oct. 1889, *Galpin*, 572!

Gerbera piloselloides is the most widely distributed of all the Gerberas, and extends from the extreme south-western part of Africa (Cape Peninsula) along the coast eastwards and northwards to Abyssinia, whence, crossing the Himalayas, it enters China, Hong Kong, and Siam. Despite its extensive distribution the species has remained remarkably stable, exhibiting but small variations considering the range of its environment. It occurs also in Madagascar, where it is known by the natives as "Toboka"; and crosses the African continent on the west to Angola. In tropical Africa it ascends up to 8000 feet, † 1000 feet higher than in Sikkim, where HOOKER, THOMPSON, and WALLICH collected it. Superficially it is not unlike certain Hieracia, and the small ray-florets vary from white to pink and yellow. It was in cultivation in MILLER's time, but was soon lost, and the small size of its ray-florets does not commend it as a desirable garden plant.

GERBERA AMBIGUA, *C. H. Schultz in Flora*, xxvii. 780 (1844); *Harvey in Harv. & Sond. Fl. Cap.* iii. 522 (1865).

Syn. *Lasiopus ambiguus*, *Cassini Dict. Sc.* xv. 299 (1820);

De Candolle Prod. vii. 18 (1838); *E. Meyer in Drège*

Zwei Pfl. Doc. 197 (1843).

Gerberia ambigua, *Cassini*, l.c.

Lasiopus coriaceus, *De Candolle Prod.* l.c. 19, in part.

G. coriacea, *C. H. Schultz*, l.c. 780.

Leaves two to ten in a tuft, ascending, laxly spreading or prostrate, borne on white-tomentellous ventrally grooved short petioles $\frac{1}{4}$ –1 inch long, blade elliptic, obovate or oblong, invariably rounded (rarely minutely apiculate or obsoletely emarginate), narrowing gradually

* *G. piloselloides* var. *transvaalensis* Dümmer. Typae persimilis sed foliis angustioribus lanceolatis vel oblanceolatis utrinque longe denseque albo-villosis differt. Specimina (2) in Herb. Kew.

† It also occurs in Uganda at elevations of 4000–5000 feet but is of rare occurrence, usually flowering in the low grassland formations after fire.

from below the middle into the petiole, $1\frac{1}{2}$ – $4\frac{1}{2}$ inches long, $\frac{3}{4}$ –2 inches broad, thinly coriaceous, dark olive green on the upper surface, the latter with appressed subbristly hairs, or eventually quite glabrous, closely white-felted beneath, the midrib and its five to eight pairs of lateral nerves most conspicuous below; margin entire or subsinuate. Scapes solitary, in pairs or threes, ebracteate, white-felted or eventually glabrescent, $2\frac{1}{2}$ –13 inches long. Involucral bracts 2–3-seriate, acutely acuminate, white tomentose or eventually glabrescent towards their tips, $\frac{1}{4}$ – $\frac{1}{2}$ inch long. Flower-head $\frac{3}{4}$ – $1\frac{1}{2}$ inch across, the ray-florets ascending-spreading, narrow, often double the length of the longest involucral bracts, sulphur-yellow, or cinnabar-red? Achene puberulous. Pappus rufous.

Hab. Coast Region. Uitenhage Div.; Uitenhage, *Zeyher*, 1032! *Ecklon* and *Zeyher ex Harvey*. Albany Div.; Albany, *Zeyher*, 849! on grassy hills of the mountains at Grahamstown, 2000 feet, Nov., *MacOwan*, 56! Alexandria Div.; Zuurebergen at Strubels, Dorn Nek and Botjesrivier, 2000–3000 feet, July, *Drège*!

G. ambigua has a restricted geographical range, and in this respect, as in its relationship, is nearest to the succeeding species. It was discovered by the traveller COOPER* in 1860, and by the Rev. Mr. Baur,† a Moravian Missionary at Bazeia in Tembuland, between elevations of 2000 to 2500 feet above sea level.

GERBERA DISCOLOR, *Sonder ex Harvey*, l.c. 522.

Leaves in tufts of three to twelve, laxly spreading or straggling; petiole $\frac{1}{2}$ –5 inches long, white or eventually glabrous and brownish, except for the sheathing base which is often invested with long white silky hairs; leaf-blade oblong-lanceolate or oblong-oblanco-ate, subacute, apiculate or rounded, tapering from about the middle into the slender petiole, $1\frac{1}{2}$ –6 inches long, $\frac{1}{2}$ – $1\frac{1}{2}$ inch broad, thin, coriaceous, light dull green and glabrous above at maturity, white-felted below the midrib and its four to eight pairs of lateral nerves most prominent on lower surface; margin entire or scarcely sinuate, occasionally distant and obscurely denticulate. Scape invariably solitary, ebracteate, 4–15 inches long, white-felted in the upper half, less so below, glabrescent towards the base or with a few long straggly whitish hairs. Involucral-bracts usually 2-seriate, white-felted, occasionally glabrescent and purplish at their tips, acuminate, $\frac{1}{4}$ – $\frac{5}{8}$ inch long. Flower-head $\frac{3}{4}$ – $1\frac{1}{4}$ inch across, the ray-florets ascending or spreading, narrow, scarcely double the length of the longer involucral bracts, sulphur-yellow on both sides. Pappus reddish.

Distribution. Kalahari Region. Transvaal. Magaliesberg, Nov., *Zeyher* and *Burke*, 1033! 66! Matebe Valley, Sept. 6, 1876, *Holub*! Pretoria, Wonderboompoort, *Rehmann*, 4460! *MacLea*, 5774! Skinner's Court, Pretoria, Aug. 19, 1903, *Burtt-Davy*, 584!

A species usually growing on wet boggy clay ground, and, like the

* No. 2551.

† No. 304.

preceding, with yellow ray-florets. The leaves of the former are used by the Kaffirs to bind on their wounds, according to BURTT-DAVY.

GERBERA PLANTAGINEA, Harvey in Harv. & Sond.

Leaves in tufts of two to six, straggling, or laxly spreading; petiole $\frac{1}{2}$ – $3\frac{1}{2}$ inches long, sparsely white straggly-haired, brownish; blade oblanceolate-oblong or obovate-oblong, obtuse or subacute, tapering gradually from about the middle into the sheathing petiole, 2–5 inches long, $\frac{1}{2}$ – $1\frac{1}{2}$ inch long, thin in texture, light green on both surfaces, glabrous above at maturity, at first cobwebby, then thinly pubescent or pilose on the midrib, its three to six pairs of yellowish nerves below; margin entire or with distant very obscure obtuse teeth, sparingly ciliate or glabrous. Scapes one or two to a plant, slender, ebracteate, 6–12 inches long, white-felted towards the apex, glabrescent and brownish, or with long scattered hairs towards the base. Involucral scales 2–3-seriate, acuminate, white-villous or pubescent, $\frac{1}{4}$ – $\frac{1}{2}$ inch long. Flower-head $\frac{3}{4}$ – $1\frac{1}{2}$ inch long. Ray-florets ascending or spreading, narrow, scarcely double the length of the longest involucral bracts, yellow or saffron-red, or white within and pink without. Disc-florets purple. Pappus violet-purple.

Distribution. Kalahari Region, Transvaal; Magaliesberg, *Burke* and *Zeyher*, Pretoria; on hills above the Aapias River, *Rehmann*, 4432! Eastern Region, Natal; Mooi River, Oct. 24, 1888, *Wood*, 4050!

Var. pusilla, Dümmer, var. nov.*

Very similar to the type, but differentiated by the relatively dwarfer habit, differently shaped leaves, and longer ray-florets. Crown bulbous, white lanuginose. Leaves two to five, rosulate, shortly petiolate; petiole not exceeding $\frac{1}{2}$ inch, white and softly hirsute; blade ovate or elliptic, subacute, 1–2 inches long, $\frac{1}{2}$ –1 inch broad, equally dull light green and covered sparingly with a white indumentum, either of a short or long and silky character, on both surfaces. Scape 1–6 inches long. Ray-florets more than double the length of the involucral bracts.

Distribution. Kalahari Region, Transvaal; in fields near Pretoria, 4000 feet, Sept. 1875, *MacLea*, 3123!

G. plantaginea, characterized when in fruit by the violet-purple pappus, is sparingly represented in the Transvaal and Natal, where it usually occurs on grassy stretches of the hills and fields. A specimen recently gathered by BURTT-DAVY on shallow gravelly soil at elevations of 4832 feet at Pinedene near Irene may perhaps be identical with this species, but the leaves are too immature to decide this point.

G. glandulosa, Dümmer, sp. nov.†

Leaves tufted, five, ascending, distinctly petiolate; petiole $\frac{1}{2}$ – $2\frac{1}{2}$

* *G. plantaginea* var. *pusilla* Dümmer. Typae persimilis sed habitu humiliore, foliis ellipticis brevioribus latioribusque differt. (Herb. Kew. et Bolus.)

† *G. glandulosa* Dümmer. Species nova, valde distincta, petiolis scapisque stipitate glandulosis. (*Junod*, 567, Herb. Kew.)

inches long, sparingly white pilose, and stipitately glandular; leaf-blade elliptic oblong, or oblong, rounded at the apex, rounded or slightly narrowing at the base, 2-4 inches long, half as broad, membranous, light green and slightly scabrid to the touch at maturity, sparingly pilose below; nerves five to seven pairs; margin subentire or boldly sinuate, ciliolate. Scapes solitary or in pairs, $3\frac{1}{2}$ -9 inches long, ebracteate, pilose, stipitately glandular, especially towards the densely pubescent summit. Involucral bracts 2-seriate, acuminate, $\frac{1}{4}$ - $\frac{1}{2}$ inch long, externally sparingly pubescent. Flower-head $1\frac{1}{4}$ inch across, its ray-florets whitish according to JUNOD, and about twice as long as the involucre-bracts. Achenes sparingly puberulous; pappus dark violet-purple.

Despite the superficial resemblance of this novelty to forms of *G. viridifolia*, the gland-tipped hairs which invest its petioles and scapes distinguish it from any of its allies. M. JUNOD is responsible for its discovery on the hills near Shilouvane in the Northern Transvaal, in August 1899.

GERBERA VIRIDIFOLIA, C. H. Schultz in *Flora*, xxvii. (1844), 780; Harvey, l.c. 523, in part; Lynch in *The Garden*, xlix. (1896), i. 162; Nicholson *Gard. Dict.* v. 389.

Syn. *Gerbera viridiflora*, Walpers *Rep.* vi. 315 (1846).

G. nivea, Grignan in *Rev. Hort.* (1908), 560, not of other authors.

Lasiopus viridifolius, and vars. *hirsutus* and *medius*, De Candolle, l.c. 19.

L. coriaceus, De Candolle, l.c. 19.

Lasiopus viridiflora, De Candolle ex Walpers, l.c.

Root-crown copiously white-silky. Leaves in tufts of two to six, laxly spreading, petioles $\frac{1}{2}$ - $2\frac{3}{4}$ inches long, thinly white-pilose; leaf-blade elliptic or elliptic-oblong, subacute or obtuse (rarely rounded), tapering abruptly into the petiole, 1- $3\frac{1}{2}$ inches long, $\frac{1}{2}$ - $1\frac{1}{2}$ inch broad, thinly coriaceous, equally light green and thinly caescent and pilose on both sides, eventually thinly pilose or entirely glabrous above, the midrib (occasionally glabrescent also below), its four to six pairs of lateral veins most obvious on the lower leaf-surface; margin shortly ciliate or glabrous, entire or subsinuate. Scape solitary or in pairs, 3-12 inches long, ebracteate, thinly white-felted and straggly haired, or eventually glabrescent or glabrous towards the base. Involucral bracts 2-3-seriate, $\frac{1}{4}$ - $\frac{1}{2}$ inch long, hairy or glabrescent. Flower-heads $\frac{3}{4}$ - $1\frac{1}{2}$ inch across, the ray-florets narrow, usually about twice as long as the involucral bracts, either yellow on both sides or white above, pale flesh, red or purple beneath. Pappus dirty white or reddish.

Distribution. Coast Region. Albany Div.; in grassy and stony places near Grahamstown, MacOwan! Queenstown Div., Bramneck, 3500 feet, Jan., Baur! British Kaffraria (1860), Cooper, 173! MacOwan, 56! Tembuland; Mount Bazeia, Baur, 741! 2500 feet, Oct.,

Baur, 525! Griqualand East; on grassy slopes about Kokstad; 4300–5000 feet, Oct. 1882, *Tyson*, 466! 1529! Kalahari Region. Transvaal; stony mountain-slopes near Lydenburg, Sept. 1895, *Wilms*, 776? (burnt specimens); Oct. 1884, *Wilms*, 773!

Var. OBLONGIFOLIA, *Dümmmer*.

Syn. Lasiopus viridifolius var. oblongifolius, De Candolle, l.c.

Leaves thickly coriaceous, oblong or obovate-oblong, rounded at the apex, ending abruptly in a short petiole, 2–3½ inches long (including the petiole), ¾–1 inch broad, almost glabrous at maturity. Achene not densely appressedly bristly-haired, but with scattered minute tubercles, and beaked. Pappus reddish.

Distribution. Coast Region. Cathcart Div.; grassy spots on the Blesbok Flats near the Windvogel Berg, 3000 feet, Nov., *Drège*!

Var. Woodii,* *Dümmmer*.

Leaves much larger than those of the type; petiole semiterete, brownish, 1–3 inches long, inconspicuously warted, sparingly pilose or eventually glabrescent; blade 3–5 inches long, 1½–2¾ inches broad, oblong or elliptic-oblong, cordate at the base, thinly coriaceous, entirely glabrous on both sides at maturity, light green above, somewhat paler below, the midrib and its six to seven pairs of lateral nerves, which latter unite towards the margin and form an intramarginal band, very well developed on the lower surface; margin undulate and subsinuate, minutely and irregularly warted-denticulate. Scape and flower-head as in the type. Pappus white. Achene bristly haired.

Were it not for its associations with *Gerbera Jamesonii*, this species would scarcely have evoked the horticultural attention it has, for it does not possess the beauty which would incite the average cultivator to speak about it. It was a happy inspiration which led Mr. LYNCH to effect a union between it and *G. Jamesonii*, resulting in the sterling race of hybrids as we now know them.

Seeds of this species were obtained by LYNCH from Mr. R. W. ADLAM in 1894, and in the following year it bloomed in the Cambridge Botanic Gardens, specimens being sent to Kew for verification, which now repose in the Herbarium. The species enjoys a fairly wide distribution from the Albany District right up to the Transvaal, and is represented in Natal by a finer-headed variety which I have named *Woodii*. MARLOTH in his fascinating work on the Cape Flora alludes to *G. viridifolia* as one of the few "green humus plants" occurring in South Africa. After bush-fires the subsequent scapes are exceedingly dwarfed and stunted.

The variety *Woodii* is a welcome addition to the Gerberas, and from a cultural standpoint superior to the type, from which it is at once distinguished by its much larger leaves, resembling in this respect the leaves of *G. glandulosa*, by their glabridity, and by their cordate bases. It was collected by Director MEDLEY WOOD on a hill near Weenen in

* *G. viridifolia var. Woodii* Dümmmer. Var. nov. Typae persimilis, sed foliis majoribus basi cordatis mox glaberrimis facile distinguenda. (*Wood*, 4458. *Herb. Kew.*)

Natal, at elevations of about 4000 feet, in April 1891, and according to him the ray-florets are white above and coppery beneath.

G. PARVA, *N. E. Brown in Kew Bulletin* (1895), 27; *Oliver in Hooker's Icones Plantarum*, t. 2376 (1895).

Leaves small, in tufts of five to twelve, borne on very slender yellowish or brownish sparingly white-tomentellous or glabrous petioles $\frac{3}{4}$ –1 $\frac{1}{4}$ inch long; leaf-blade broadly ovate, obtusely or acutely apiculate, subcordate at the base, $\frac{1}{3}$ – $\frac{2}{3}$ inch long, $\frac{1}{4}$ – $\frac{1}{2}$ inch broad, thinly leathery, pale green, glabrous and apparently nerveless above, thinly white-felted and one-nerved beneath; margin coarsely dentate, the teeth triangular, subacute or obtuse. Scape solitary, in pairs or threes, small and slender, ebracteate, except towards the apex, 2–4 inches long, white-tomentose towards the apex, glabrescent or glabrous towards the base. Involucral bracts 2–4-seriate, acutely acuminate, $\frac{1}{8}$ – $\frac{1}{4}$ inch long, glabrous, greenish or purplish. Flower-head $\frac{1}{2}$ – $\frac{3}{4}$ inch across. Ray-florets eighteen to twenty-two, about double the length of the bracts, white above, rosy below. Pappus white.

The smallest of the group, but withal a charming little plant, with flower-heads not unlike a Daisy. It was collected by Mr. MAURICE EVANS (No. 57) in Natal, on the Drakensberg Range, in damp places at elevations of 6000–7000 feet, not far from the Bushmans River, but is evidently a rare plant, as it has not been rediscovered since July 1894.

GERBERA AURANTIACA, *C. H. Schultz in Flora*, xxvii. (1844), 781; *Walpers Rep.* vi. 317 (1846); *Harvey*, l.c. 523; *Wood Illustr. Natal Plants*, iv. t. 371 (1905); *N. E. Brown in Bot. Mag.* t. 8079 (1906); *Hariot in Le Jardin* (1907), 250.

Syn. Gerbera Elsae, *W. H. in Gardeners' Chronicle*, xxxviii. 5 (1905).

Crown of root-stock densely white sericeous-villous. Leaves in tufts of two to six, erect or ascending, oblanceolate or narrowly oblong-lanceolate, acute at the apex, tapering from about the middle into the short broad sheathing base, 4–11 inches long (inclusive of the petiole), $\frac{3}{4}$ –2 inches broad, leathery, light green on both surfaces, more or less minutely pubescent above, white-cobwebby beneath, especially in the region of the midrib, but eventually almost glabrous; lateral nerves twelve to fifteen pairs, and with their reticulations most conspicuous on the lower surface; margin entire, or obscurely denticulate, obsoletely wavy and subsinuate, cobwebby or glabrous. Scape invariably solitary, 4–16 inches long, ebracteate, white-felted, glabrescent or glabrous towards the base. Involucral scales 2–4-seriate, acutely acuminate, $\frac{1}{4}$ – $\frac{3}{4}$ inch long, white-felted. Flower-head 1 $\frac{1}{2}$ –3 inches across, the ray-florets often more than twice as long as the involucral bracts, dark blood-red above, yellowish or brownish underneath; disc-florets yellowish or brownish. Pappus violet-purple above.

Distribution. Eastern Region. Natal, Port Natal, *Sanderson*, 154! *Sutherland*! Pietermaritzburg, 2000–3000 feet, Oct. 1858; from the top of the Town Hill, Pietermaritzburg, Oct. 1883, *Sanderson*! Nov., *Rutter ex Wood*; grassy hill, Liddesdale, near Howick, 5000 feet, Dec. 12, 1889, *Wood*, 4254! between Greytown and Newcastle, Nov. 1883, *Wilms*, 2082! near Greytown, April, *Wood*, 4986, *ex Wood*; Zululand, Qudeni, 6000 feet, May, *Davis*, 85, *ex Wood*. Kalahari Region. Transvaal, *Sanderson*; Modderfontein, Nov. 1900, *Conrath*, 542!

A desirable acquisition to the Gerberas now fortunately in cultivation, but as yet too rare to have become known. Mr. N. E. BROWN, who is responsible for the description and figure in the *Botanical Magazine*, says that it is allied to the better-known *G. Jamesonii*, differing from that species in its entire leaves and the rich blood-red colour of its more numerous and more crowded ray-florets. It was originally discovered by the botanical collector KRAUSS on a hill near Pietermaritzburg, where subsequent collectors have also found it, and it is remarkable that such a beautiful plant should not have been introduced from such a frequented locality into cultivation long ago. MEDLEY WOOD mentions that in nature the flower-heads vary from a scarlet to a deep crimson, and plants introduced into the Botanical Gardens at Durban (Natal) are growing well. The species extends into the Transvaal, but is sparingly represented there.

The figure in the *Botanical Magazine* was prepared from a plant which flowered at Kew in June 1905, purchased from the late M. MAX LEICHLIN of Baden-Baden, who stated that it was introduced from Natal by a daughter of Baron SAINT PAUL; he distributed plants under the name of *G. Elsae*. Mr. BROWN believes that *Gerbera aurantiaca* is probably half hardy, but as the region in which it grows has a very small rainfall during the winter, it requires greenhouse protection with very little water during that season. It would undoubtedly do well outside in the extreme south and west of England. Two varieties occur in nature, which have, however, not been introduced to cultivation.

Var. alba,* *Dümmer*.

Leaves with the cobwebby indumentum persisting on the lower surface. Ray-florets creamy-white. Pappus violet-purple.

This charming variety was detected by Mr. J. WYLIE, Curator of the Durban Botanical Gardens, on the Zwartkop Mountain in Natal, at elevations of 4000–5000 feet above sea-level, in November 1906.

Var. Wyliei,† *Dümmer*.

Leaves, scape, and flower-head as in the species, but the ray-florets yellow, and the pappus a decided tawny tint.

* *G. aurantiaca* var. *alba* Dümmer. Var. nov. Typae persimilis, sed foliis subtus griseo-araneosis, floribus ligulatis albidis recedit. (*Wood*, 10151, Herb. Kew. et Natal.)

† *G. aurantiaca* var. *Wyliei* Dümmer. Var. nov. Ab typae floribus ligulatis flavidis, pappo pallide brunneis distinguitur. (*Wood*, 10150, Herb. Kew. et Natal.)

G. aurantiaca var. *Wyliei* hails from the same locality as the preceding variety, and was gathered at about the same time by Mr. WYLIE, with whose name I have pleasure in coupling this plant. Both varieties are well worthy of culture and their introduction is greatly to be hoped for.

GERBERA ELEGANS, *Muschler in Engler's Bot. Jahrb.* xlv. 124, f. 7 (1911).

Crown of rootstock densely white-lanate. Leaves in tufts of fours, ascending, ovate-elliptic or ovate-lanceolate, subacute, narrowing gradually from about the middle into the longish sheathing petiole, $3\frac{1}{2}$ –5 inches long, $\frac{1}{2}$ – $\frac{1}{2}$ inch broad, dark green and glabrous above, greyish cobwebby beneath, the margin coarsely dentate, the teeth obtuse or subacute, seven to ten on each leaf-side. Scape solitary about 10 inches long, slender, glabrous below, densely pubescent above, ebracteate. Involucral scales in few series, appressed, lanceolate or triangular, very glabrous. Flower-head $1\frac{1}{2}$ –2 inches across, the ray-florets ascending or spreading lustrous reddish-brown. Pappus whitish-yellowish.

I have not seen this species, but judging from the description it is evidently a very acceptable plant. The author states that it shows a relationship to the tropical African *G. Lasioopus*, but is differentiated by the toothed leaves and the relatively greater glabridity of the plant. *G. elegans* was detected by BACHMANN (No. 1511) in 1887 and 1888 in the eastern coastal districts of Cape Colony, but precisely where it is impossible to ascertain.

Gerbera Lynchii,* Dümmer.

Leaves tufted, five to seven, long-petioled, ascending or laxly spreading; petioles $1\frac{1}{2}$ –2 inches long, chestnut-brown and glabrous above, paler brown and spreading pilose below, ventrally grooved; leaf-blade small, elliptic or elliptic oblong, obtuse or rounded at the apex, obliquely rounded or slightly cuneate at the base, $\frac{3}{4}$ – $1\frac{1}{2}$ inch long, $\frac{1}{2}$ – $\frac{1}{3}$ inch broad, coriaceous, dark glossy green and glabrous above, white-felted below, the midrib and its five to six pairs of lateral veins raised and brownish at maturity; margin obsoletely and distantly dentate. Scapes two, slender, ebracteate, about 5– $5\frac{1}{2}$ inches long, straggly white-pilose. Involucral bracts 2–3-seriate, white cobwebby below, lanceolate, acute, $\frac{1}{4}$ – $\frac{1}{2}$ inch long. Flower-head $1\frac{1}{4}$ inch across, the ray-florets spreading, purplish-pink (in a dried state), apically two- or three-toothed; disc-florets yellowish. Pappus creamy-white; immature achenes glabrescent.

The specimen upon which the preceding description is founded is preserved in the Kew Herbarium, and hails from the Clarkson area

* *G. Lynchii* Dümmer. Species nova, *G. parvae* N. E. Brown, affinis, sed foliis ellipticis coriaceioribus supra atroviridibus, subtus creberrime albo-lanuginosis, nervis lateralibus prominalis, pedunculis ebracteatis, capitulis majoribus, floribus ligulatis purpureis differt. (Herb. L. Kitching, July 1880, Kew.)

of the Humansdorp District of Cape Colony, but who is responsible for its discovery is problematical. *G. Lynchii* is certainly one of the gems of the dwarfer-growing species, and has much in common with *G. parva*, but is easily distinguished from it by the elliptic more coriaceous leaves, their dark glossy green upper and thickly white-felted lower surfaces, the nude scapes, larger flower-heads, which have, moreover, fine purplish-pink radial florets.

Fewer individuals have contributed more valuable data to contemporary literature regarding Gerberas than Mr. IRWIN LYNCH, M.A., Curator of the Cambridge Botanic Gardens, and it gives me great pleasure to associate his name with this charming little novelty (fig. 55).

GERBERA NATALENSIS, C. H. Schultz in *Flora*, xxvii. 778 (1844); *Wood Illustr. Natal Plants*, vi. t. 546 (1910); *Walpers Rep.* vi. 315 (1846).

Syn. Gerbera viridifolia, *Harvey in Harv. & Sond. Fl. Cap.* iii. 523 (1865), in part.

Gerbera tuberosa, *Klatt in Bull. Herb. Boiss.* iv. 845 (1896).

Crown of the tuberous rootstock densely white-silky. Leaves two to three, small, elliptic-oblong, acute, tapering at the base into a short white-silky sheathing petiole, 2-2½ inches long, ½-¾ inch broad, thinly coriaceous, light green and sparingly pilose above and below; margin entire and ciliate. Scapes invariably solitary or in pairs (rarely in threes or fours), dwarf, 1-6 inches in length, cottony-white, ebracteate. Flower-head ½-1 inch across, the involucre-scales 2-3-seriate, ¼-½ inch long, sparingly pilose. Ray-florets twice as long as the latter, erect or ascending-spreading, white within, often pink without; disc-florets yellow. Pappus dirty or creamy-white.

Distribution. Eastern Region. Natal; Port Natal, *Krauss*, 452! near Port Natal, *Sutherland*! Pietermaritzburg, 2000-3000 feet, Sept.-Oct. 1858, *Sutherland*! Inanda, 1800 feet, Feb., *Wood*, 203! among young grass, Drakensberg, Polcra, 5000-7000 feet, July 1895, *Evans*, 515! Sydenham, 400-600 feet, Aug., *Wood*, 11697 *ex Wood*, l.c.

In stature *G. natalensis* approaches most closely to *G. parva*, but is at once distinguished by its hairy facies and its peculiarity of blooming when leafless, this often being accelerated by the effects of bush-fires. MEDLEY WOOD remarks that it is among the earliest of the flowers to appear in the spring, and is often in abundance on hills from which the grass has been recently burned off. Except in the more cuneate slightly sinuate-dentate and ciliate leaves, the ray-florets which are purplish towards their tips, and the pale reddish pappus, I can find no other differences to distinguish Klatt's plant from *G. natalensis*.

GERBERA KRAUSSII, C. H. Schultz, l.c. 781; *Walpers Rep.* vi. 316 (1846); *Harvey*, l.c. 523; *Wood Illustr. Natal Plants*, i. 46, t. 56 (1899).

Syn. G. Kraussii var. Kraussii, C. H. Schultz, l.c.; *Harvey*, l.c.

Leaves in tufts of two to five, elliptic or narrowly elliptic-oblong, subacute, obtuse or rounded at the apex, tapering gradually from below the middle into $\frac{1}{2}$ – $2\frac{1}{2}$ inches long hairy petioles, 2–6 inches long, $\frac{3}{4}$ –2 inches broad, more or less coriaceous, olive green and densely setose velvety, or eventually glabrescent and scabrid above, white- or cream-felted and with the midrib and its six to nine pairs of lateral veins conspicuous below; margin occasionally wavy, entire, or distantly and obsoletely denticulate, or almost sinuate. Scapes solitary or in pairs, 4–14 inches long, ebracteate, covered with a white deciduous felt, or with spreading hairs towards their bases. Involucral scales 2–3-seriate, $\frac{1}{4}$ – $\frac{3}{4}$ inch long, white-tomentose. Flower-head 1–2 inches across. Ray-florets ascending-spreading or spreading, about double the length of the involucral bracts, white or cream-coloured above, pink or coppery beneath; disc-florets purplish. Pappus violet-purple, occasionally rufous.

Distribution. Eastern Region. Kentani; Columba Mission, 1000 feet, Nov. 30, 1906, *Miss Alice Pegler*, 1400! Natal; Port Natal (1840), *Krauss*, 402! *Sanderson*, 259! Inanda, *Wood*! below the Berg, Umzeila, *Mudd*! dry fields, Tolivet, 2500 feet, Oct. 15, 1909, *Rudatis*, 752! Kalahari Region. Transvaal; damp grassy ravine, summit of Saddleback Mountain, Barberton, 4500–5000 feet, Sept. 1889, *Galpin*, 540! 541! stony mountain-slopes near Lydenburg, Sept. 1885, *Wilms*, 770!

Var. GUEINZII, *Harvey*, l.c.

Syn. G. nervosa, *Sonder in Linnaea*, xxiii. 70 (1850).

Leaves invariably rounded, or cordate at the base; white-felted beneath. Pappus violet-purple or dirty white.

Distribution. Eastern Region. Natal; Port Natal (1851), *Plant*, 37! *Sanderson*, 53! *Gerrard*, 174! Dry meadows, Ifafa, 1900 feet, March 4, 1908, *Rudatis*, 293! at Pietermaritzburg, Oct. 1883, *Wilms*, 2079!

Var. sinuata, *Dümmer*.*

Leaves large, coarsely dentate-sinuate, obliquely rounded at the base, subacute or rounded at the apices, $4\frac{1}{2}$ –6 inches long, $2\frac{1}{2}$ – $3\frac{1}{4}$ inches broad, velvety setose or eventually scabrid above, white-felted below; petioles $1\frac{1}{2}$ –4 inches long, white felted. Scapes slender, 12–16 inches long, white-felted. Ray-florets yellow. Pappus rufous.

Distribution. Natal, among grass, Sinkwasi, April 2 (1888), *Wood*, 4010!

G. Kraussii abounds on grassy land all over the Natal area and extends inland into the Transvaal, where Mr. E. E. GALPIN discovered it on the Saddleback Mountain. The plant is known to the natives

* *Gerbera Kraussii* var. *sinuata* Dümmer. Var. nov. A typo foliis sinuatis differt.

of Natal as 'Cabazaan,' and, according to MEDLEY WOOD, they use its leaves to make a lotion for curing toothache. A more critical study of the Tropical African species may hereafter tend to show that this species may perhaps only represent an extreme southern geographical form of *Gerbera alyssinica*.

GERBERA GALPINII, Klatt in *Bull. Herb. Boiss.* iv. 844 (1896).

Crown of rootstock densely white-woolly. Leaves tufted, six, erect, oblanceolate, subacute, tapering gradually from about or above the middle into the longish petiole, $2\frac{1}{4}$ – $8\frac{1}{2}$ inches long (inclusive of the petiole), $\frac{1}{3}$ – $\frac{1}{2}$ inch broad, coriaceous, entirely glabrous on both sides, the midrib obvious on both surfaces, but the lateral veins not apparent; margin entire. Scape solitary, slender, 16–17 inches long, ebracteate, glabrescent or glabrous below, cobwebby towards the flower-head, which is about $1\frac{1}{4}$ – $1\frac{1}{2}$ inch in diameter. Involucral bracts 2–3-seriate, $\frac{1}{4}$ – $\frac{1}{2}$ inch long, glabrous at maturity. Ray-florets bright yellow, scarcely double the length of the involucral scales, 2-toothed. Pappus very pale dun-coloured. Achene densely puberulous.

Distribution. Kalahari Region. Transvaal; swampy ground, Umlomati Valley, 4000 feet, Barberton, Oct. 1890, *Galpin*, 1132!

Undoubtedly one of the most distinct of the Gerberas, *G. Galpinii* is easily recognized by the stiff erect pose of the oblanceolate leaves, which are moreover wholly glabrous and do not possess the lateral nerves which characterize so many of its congeners. The species must show some variation, for KLATT, basing his description upon the same number of Galpin's, alludes to the leaves as slightly pilose on the upper surface, while the margins are slightly sinuate and toothed; this, however, is not the case in the Kew specimen. We are indebted for this acquisition to Mr. E. E. GALPIN, who has been assiduous in his efforts at exploiting the floral wealth of the eastern districts at the Colony and also that of the Transvaal.

Gerbera Burchellii, * Dümmer.

Leaves tufted, three, ascending, borne on slender glabrous rich brown petioles, 1–2 inches long; blade elliptic, obtuse, narrowing towards the base, $1\frac{1}{4}$ – $2\frac{1}{2}$ inches long, $\frac{1}{3}$ – $\frac{1}{2}$ inch broad, leathery, wholly glabrous, the midrib and its four to six pairs of veins raised and most conspicuous on the lower surface; margin distantly and obsoletely toothed, five to seven teeth on each side. Scape solitary, slender, 16 inches long, ebracteate, glabrous below, thickly pubescent towards the flower-head. Involucral bracts 2–3-seriate, acute, $\frac{1}{4}$ – $\frac{1}{2}$ inch long, glabrous dorsally, ciliate. Flower-head when expanded $1\frac{1}{2}$ inch across, the ray-florets narrow, tridentate, yellowish? Pappus rufous. Outer achenes puberulous.

* *G. Burchellii*! Dümmer. Sp. nov. *G. Galpinii*, valde affinis, sed foliis brevioribus latioribusque obsolete dentatis, nervis conspicuis, pappo pallide rufo differt. (*Burchell*, 3876, Herb. Kew.)

G. Burchellii was discovered by the eminent and gifted traveller WILLIAM BURCHELL between Kaffir Drift (Date Tree Station), Blaauw Krantz and the Kowie River in September 29, 1813, in the Bathurst Division; it exhibits an affinity to *G. Galpinii* in the glabridity of the leaves, but is at once distinguished by their different form, their toothing, and prominent nervation. The pappus, moreover, is of a distinct reddish tinge.

GERBERA JAMESONII, *Adlam in Gardeners' Chronicle*, iii. (1888), 775; *Hooker in Botanical Magazine*, t. 7087 (1889); *Allen in Gardeners' Chronicle*, v. (1889), 772, f. 122; *D. T. F. l.c.* xviii. (1895), 643; *Ewbank, l.c.* 719; *Arnott, l.c.* xxviii. (1900), 64; *Barr, l.c.* xxi. (1902), 232; *H. J. K. and Nichols, l.c.* 377; *l.c.* '421; *Jenkins, l.c.* xxxii. (1902), 165, 328; *Hindmarsh, l.c.* 182; *Watson, l.c.* xl. (1906), 288; *Lynch, l.c.* 314; *Burt-Davy, l.c.* 421; *Adnet, l.c.* xli. (1907), 18; *xl.ii.* (1907), 186; *xl.iii.* (1908), 433; *L. l.c.* xlv. (1909), 273, 290; *Lynch, l.c.* 340; *xl.vii.* (1910), 272; *L. (1911)*, 366; *Lynch, lii.* (1912), 107; *Jour. Hort. Soc. Proceed.* xiii. 178 (1891), with figure; *Lynch in Flora and Sylva*, iii. (1905), 206-208, with coloured plate; *Mottet in Rev. Hort.* (1903), 36-38, with coloured plate; *Gallet in Rev. Hort. Belge*, xxxii. (1907), 292; *Watson in The Garden*, xxxvi. (1889), 340, with coloured plate; *xxxvii.* (1890), 290; *Lynch, l.c.* 405; *xl.viii.* (1895), ii. 231; *Arnott, l.c.* liii. (1898), i. 549; *E. H. J. l.c.* lx. (1901), ii. 207; *Williams, l.c.* lxii. (1902), ii. 25; *Thornycroft, l.c.* 39; *Dallimore, l.c.* 227; *H. C. l.c.* lxv. (1904), i. 333; *Nicholson Gard. Dict.* v. 389; *Schneider in Le Jardin* (1903), 20, f. 12; *Paquet, l.c.* (1907), 248-249, f. 132-134; *Adnet, l.c.* (1909), 136-137, f. 91 and coloured plate (hybrids); *Peters in Gartenflora* (1905), 617, with coloured plate; *Oesterr. Gartenzeit.* iii. (1908), 25, f. 5; *Watson in Garden and Forest*, iii. (1890), 500, f. 64; *Vilmorin in Rev. Hort.* (1909), 102-106; *La Tribune Hortic.* iv. (1909), 682-684, with ff.

Roots whipcord-like, fascicled. Leaves in tufts of two to six or more, erect, ascending or arcuate, borne on slender slightly hairy or eventually glabrous petioles 2-8 inches long or more; blade elliptic, 6-18 inches long, 2-4 inches broad, terminated by a subacute triangular lobe, runcinately pinnatifid, "with the margins of the lobes undulate and cut into unequally sinuately toothed obtuse or acute ciliolate lobules," thinly coriaceous in texture, light or dark green, and sparingly pubescent or eventually glabrescent above, paler and white cobwebby pubescent beneath. Scape $\frac{1}{2}$ -3 feet long, ebracteate, white pubescent, pilose or cobwebby. Involucral scales 2-3-seriate, acuminate, $\frac{1}{4}$ -1 inch long, white cobwebby. Flower-heads $1\frac{1}{2}$ -5 inches or more in diameter. Ray-florets spreading, invariably flame-coloured or clear yellow, or varicoloured, narrowly oblong. Pappus white or creamy-white.

Distribution. Kalahari Region. Transvaal; Houtbosch, 1875-1880, *Rehmann*, 6113! *Barber*! Latrobe River, *Nelson*, 500! on hills

near Barberton, Aug. 1886, *Jameson*, 3835! 2800 feet, Aug. 1886, *Bolus*, 7611! between bushes on the way to Spitzkop, towards the Komati River, July 1887, *Wilms*, 763! in bushy places at Lydenburg, Nov. 1894, *Wilms*, 763a!

According to BURTT-DAVY, formerly Government Botanist and Agrostologist of the Transvaal, *G. Jamesonii*, the 'Barberton Daisy' or 'Transvaal Daisy,' is common in the "De Kaap" Valley and at various points all along the eastern slopes of the Drakensberg Range at altitudes of about 2000–3500 feet; it grows also abundantly on the Government tobacco farm in the Zoutpansberg District about 150 miles north of Pretoria, and is reputed to be abundant in the Middelberg District. PETER BARR alludes to their growth in the Transvaal among magnetic stones of so powerful a nature that on running one of these along the edge of a table, a needle will as quickly follow.

The discovery of this beautiful and valuable plant is ascribed to the Austrian traveller REHMANN, who travelled through various parts of South Africa in search of plants between the years 1875 and 1880; but it was many years later ere it was described and named in compliment to the Hon. R. JAMESON, then Member of the Legislative Assembly, who found it on the goldfields near Barberton, whence the vernacular name. It was introduced into the Natal Botanic Gardens in 1888 and flowered there the subsequent year, the same year as at Kew, when a cream-orange form expanded in the Alpine House. Now it is difficult to find a place where its merits are unknown, and it is rather surprising that the Americans have not appreciated its possibilities more. At Los Angeles, in California, it does not do satisfactorily, but perhaps the cultural conditions are at fault. BURTT-DAVY mentions that it grows luxuriantly in the Pretoria Gardens at elevations of 4500 feet, withstanding several degrees of frost with impunity, and I have experienced no difficulty in its cultivation outside at the Municipal Botanical Gardens, Cape Town. We are indebted to Mr. Tillett of Norwich for its introduction to England, in whose garden it flowered in 1887; but the horticultural possibilities of the species were only fully appreciated by Mr. IRWIN LYNCH,* whose experiments, resulting in the magnificent race of hardier hybrids † between this and *G. viridifolia*, it is unnecessary to do more than allude to in detail here.

The extreme variability displayed in the colour of the flower-heads was regarded at first to be an outcome of crossing, but it transpires that the species is prolix in this respect in its feral state, white, white suffused with rose, salmon, terra-cotta, maroon, pink, peach, amber, yellow and buff having been recorded. The greatest cultural success attained in England appears to be at Ryde, the Isle of Wight, where fine

* Awarded a First-class Certificate by the Royal Horticultural Society in November 1891.

† Compare also his article on the "Self-sterility of Gerberas," *Gard. Chron.* lii. (1912), 107.

plants are grown with flower-heads $5\frac{1}{2}$ –6 inches across; further north, as the cold increases, their chances of success become more remote. Among Continental growers M. ADNET has done herculean work at his establishment "La Roseraie," at the Cap d'Antibes, where in 1909 he effected 2700 distinct crosses, all with registered numbers giving the colour of both parents; he possesses nearly 25,000 plants, representing the fourth generation of his seedlings, of every conceivable colour, of which he says "the scale of colour is of incomparable richness. I had commenced an endeavour to identify the tints, making use of the *Répertoire de Couleurs* of the Chrysanthemum specialists, but I was obliged to give it up—there were too many of them. It might have been necessary to give them numbers, could they have been conscientiously numbered, and had it not been impossible to the keenest eye to catalogue them at sight." The innate variability of the species as regards colour is further emphasized, for M. ADNET on crossing a light pink with a deep pink had even in the first year both white and yellow flower-heads. His greatest achievement, however, is the production of a colour approaching violet, a variety which he has named in compliment to Mr. LYNCH. ADNET further alludes to differences in the colours displayed by the ray- and disc-florets respectively, and instances yellow as a correlative of dwarfness.

As the culture of the species and its varieties, crosses, and hybrids have been discussed at considerable length in the *Gardeners' Chronicle*, it appears only expedient to give the necessary references relating to this phase of the subject. SPRENGER in his garden at Vomero has had considerable success with the species, for there plants flower from April to the middle of December without protection, blooms lasting often from four to six weeks on the plant, and when cut and placed in repeatedly changed water retain their freshness from ten to twelve days, and in winter even longer. According to him the life period of the plants is ten to twelve years, after which they decline. The flower-heads, emitting no appreciable scent, remain always open and slightly nod in dull or rainy weather, and florists in Paris accept them in huge quantities, and sell them as 'Pâquerette de Barberton.' In Berlin they fetched 2 marks a dozen in 1909. LICHTENSTEIN* instituted experiments with regard to the germination of the "seeds," of which one-third are usually fertile, † and found that they lose their germinative power in three to four months. At Cancade, Nizza, in the South of France, he has tried forcing, with excellent results.* The procedure is very similar to that adopted for the Lily of the Valley; the roots are shortened to within 18–20 cm., and the plants are placed together in boxes or pots which contain a friable soil; good bottom heat, not too much moisture, and ample ventilation are desiderata. After fourteen days the flower-buds appear, and after a further lapse of another seven days the flower-

* Möller's *Deutsche Gartenzeit.* 32 (1912); l.c. 522.

† ADNET, however, states that 90 to 95 per cent. germinate, germination usually taking place in five to eight days. Their subsequent growth is extremely rapid, as they flower and fruit within nine months.

heads are ready for cutting. The first are not very large, but the subsequent ones increase in size and approach appreciable dimensions. After forcing if frost is not expected, they are planted outside in the open ground, and in autumn the crowns are divided.

Where rather arid atmospheric conditions obtain, as in the Succulent House at Kew, where the plants are excellently adapted for bordering purposes, mites are prone to attack the young leaves, and only persistent spraying with soft soap and sulphur serves to eradicate this evil; occasionally a leaf-borer makes its appearance, rendering the leaves often very unsightly by its mining propensities.

The following varieties have been recorded at various times:—

Var. atrosanguinea, *Sprenger ex Vilmorin in Rev. Horticole* (1909), 103.

Flower-heads dark blood-red.

Var. Brilliant, *Lynch*, l.c. xxxii. 442 (1902).

A cross between 'Sir Michael' and *G. Jamesonii*, with combination of characters. Flower-head vermilion.

Var. Clibran's Orange, *Lynch in Gard. Chron.* xlv. (1909), 341.

According to Lynch a fine orange; flowered in Clibran's nursery five years ago.

Var. illustris, *Vilmorin*, l.c. 104.

Flower-heads more brilliant in colour than the type.

Var. King Sol, *Watson in The Garden* (1906), 288.

Scape 22 inches high, the flower-head $4\frac{1}{2}$ inches across, rich terracotta, shaded with amber.

Var. Sir Michael, *Lynch in Gard. Chron.* xxx. (1901), 223.

Flower-heads lemon-yellow.

Var. transvaalensis, *Vilmorin*, l.c.

The following forms are alluded to by SPRENGER in *Gartenflora*, lv. (1906), 15:—

Var. transvaalensis. Foliage dark green, lyrate, with the lobes horizontally or directed upwards. Ray-florets very large, scarlet-red. A very fine form, which Herr C. SPRENGER received from the Transvaal; probably the same as *var. transvaalensis*, Vilmorin.

Var. sanguinea. Leaves deeply lobed. Flower-heads very large, shining blood-red.

Var. illustris. Leaves shortly stalked, dark green, deeply cut. Flower-heads very large with broad carmine-red ray-florets.

Var. Jolanda. Leaves erect, small, deeply lobed. Flower-heads large with narrow very long and thin bright scarlet ray-florets. Very fine.

Var. acanthifolia. Leaves very large, the margin entire above, undulate, slightly sinuate towards the base. Flower-heads very large, vermilion.

Var. superba. Leaves sinuate, dark green. Flower-heads large, purplish.

Var. vomerensis. Leaves deeply lobed. Flower-heads fairly large, light wine-red.

Var. elmensis. Leaves dark green, slightly sinuate. Flower-heads shining carmine-red.

The following are reputed hybrids * of *G. Jamesonii* and *G. viridifolia*, but doubtless some represent forms or crosses of the former :—

Albert Lefevre, † *Mottet*, l.c. ; red.

Amiral Rieunier, *Mottet in Rev. Hort.* (1908), 537 ; fine red.

Arago, † *Mottet in Rev. Hort.* (1909), 527 ; yellow-orange.

Drapeau blanc, † *Mottet*, l.c. ; pure white.

Emile Thomas, † *Mottet*, l.c. 527 ; pure rose.

Enchantress, *Mottet*, l.c. ; rose-flesh.

Evangeline, *Lynch in Flora and Sylva*, iii. 208 (1905) : rosy ray-florets paling to soft yellow in the centre.

Evangeline, *Rev. Hort.* (1904), 270 ; rose with a light yellow disc.

Grande-Duchesse Olga, † *Mottet*, l.c. ; pale striped rouge.

Hiawatha, *Lynch*, l.c. ; clear light scarlet.

Jacques Benoist, † *Mottet*, l.c. ; a fine rouge-carmine.

King Arthur, *Lynch*, l.c. ; rose-salmon.

King's Rose, *Lynch*, l.c. ; rose-salmon.

Laciniata Adneti, † *Mottet*, l.c. 527 ; rouge.

Madame Booch, † *Adnet*, l.c. ; orange-pink.

Madame Ph. de Vilmorin, † *Adnet in Le Jardin* (1909), 137 ; clear rose.

Madame René Adnet, † *Mottet*, l.c. 527 ; purple.

Mademoiselle Ruau, † *Adnet*, l.c. ; pure white.

Mademoiselle Suzanne Lefevre, † *Mottet*, l.c. ; rose.

May Queen, *Lynch*, l.c. ; soft rose.

Miss Lyons, *Mottet, in Rev. Hort.* (1908), 537 ; pure rose.

Mons. Irving Lynch, † *Adnet*, l.c. ; violet-rose.

Mons. S. Mottet, † *Adnet*, l.c. ; orange-yellow.

Perle de Croissy, † *Mottet*, l.c. ; fine clear yellow.

Président Gravereau, † *Adnet*, l.c. ; straw-yellow.

Sénateur Mézières, † *Mottet in Rev. Hort.* (1909), 527 ; rouge-violet.

Vicomtesse V. de Toulgouet, † *Mottet*, l.c. ; salmon.

Village Blacksmith, *Rev. Hort.* (1904), 270 ; *Lynch*, l.c. ; lemon-yellow.

* Cf. also *The Garden*, lxxv. (1904), i. 405, with fig. *F. J. H.* l.c. lxxiv. (1910), 368 ; l.c. lxxv. (1911), 65. † Raised by M. Lambert:

† Raised by M. Adnet at his Etablissements Horticoles du Littoral, Cap d'Antibes, France.

PRIMULA FLORIBUNDA AND *P. × KEWENSIS*.

[A GREAT deal of interest centres round the beautiful greenhouse Primula, *P. × kewensis*, especially, perhaps, from a plant-breeder's point of view. It appeared suddenly at Kew in 1900, and was then thought to be a hybrid between *P. floribunda* and *P. verticillata*, being much larger in all its parts than the former, and showing marked characters of the latter as well. For many years it proved sterile, but at last the barrier to its fertility, whatever it may have been, was broken down, and now it sets fertile seed abundantly, and has given rise to some seedling variations, particularly in the direction of mealiness. Many attempts have been made to verify the truth of the assumption of its hybrid origin by repeated crossing of the two species concerned, but only two or three times have plants resembling *P. × kewensis* been obtained, and it is unnecessary to allude here to the peculiar results often following these attempts. We have been, more than once, struck by the remarkable variation in seedlings of *P. floribunda*, not only in the depth of colour in the flower, which varies from the pale, almost sulphur tint of the variety *Isabellina* to a deep golden yellow, but in the habit of the seedlings, their different degrees of mealiness and hairiness, and above all in the size attained by foliage and flowers, approaching sometimes to that of *P. × kewensis*. Sir GEORGE WATT, who has had, perhaps, more experience of this Primula in its native home than any other botanist, kindly gives us the following information regarding it, and his remarks show how desirable is the study of plants from wild sources.—ED.]

"*Primula floribunda* is a very remarkable species. I believe I was the first to observe that in vernalion the leaves were conduplicate in that species, a fact that I half suspect will be found far more valuable than the distinction between *Primula* and *Androsace*. I am disposed to go further and to think *that* structural characteristic is more valuable from a classification standpoint than the formation of a woody stem, such as we find in *P. Lacci*, and which seems to have suggested to Professor I. B. Balfour the transference of that species from the position I had assigned to it (JOURNAL R.H.S. vol. xxix. (1904), p. 296, and xxxix. (1913), p. 203), to that of his section *Suffruticosa* (Primula Conference Report, JOURNAL R.H.S. vol. xxxix. (1913), pp. 150 and 170). It seems to me that in very dry climates, if a Primula were able to live at all, it would tend to become suffruticose, more especially if grown in a soil rich in lime. At all events that is somewhat my experience of the behaviour of *P. floribunda*. Pardon my dwelling still further on the subject of the vernalion. On page 219 of the Primula Conference Report mention is made of the Primulas being referable to two assemblages, those with the margins of the leaves

rolled backwards and those with the margins rolled inwards. The latter is thus made to include the convolute as well as the conduplicate condition. I regard that as a vital mistake, for there can be no manner of doubt that the two groups represented by *P. floribunda* and *P. Auricula* are widely different, whether that difference be a consequence or not of their veneration. It is certainly very remarkable that all the species with conduplicate veneration are more tropical than any other group of Primulas; that they inhabit a distinct area or region; and that they all resemble each other very closely.

"I turn now to *P. floribunda* in order to try to afford you some particulars in the direction I understand you desire. In India that species is confined to the N.-W. Himálaya, more especially to the outer and lower ranges between the latitudes 29° to 36° N. This is significant, for it will be recollected the rainfall of the Eastern Himálaya is in rough figures three times that of the Western. In point of altitude its range is from 1500 to 6000 feet above the sea. The lower outer Himálaya contain many outcrops of limestone, and it is where that occurs that *P. floribunda* abounds. In the higher points of its range it is found in cracks in the rocks, underneath the spray of waterfalls. The leaves are there thin, pale green, almost glabrous, and the flowers in minute, few-flowered verticils. When seen under shelter and in dry situations the leaves become larger, more distinctly hairy and hoary, the scapes elongate and the whorls of flowers become distinct. But a far greater change is observable on passing to the lower tracts of country where the species is met with. For example, on passing westward the altitude falls until in the extreme north of the Panjab it reaches very near to the plains. At the Khyber Pass it is met with, but the plant has become two or three times the size it attains in its more alpine tracts, is quite glabrous, and often mealy. It in fact comes very close to the condition we have accepted as *P. × kewensis*. The most striking points in the enhanced Khyber plant are the numerous whorls of large flowers and the very distinct foliaceous bracts around the separate whorls of flowers on the elongated scape. I would recommend that those interested in this subject should make an effort to secure seed of the Khyber plant and to use that stock in future experiments. But beyond and above all other considerations I would urge that seed of *P. Laccii* be secured from Quetta and the cultivation of that charming species be at last undertaken. I can imagine nothing more beautiful for conservatory purposes than that delightful species. . . . It luxuriates in dry situations on limestone soil. If by its conveyance to Europe it were found to dispense to some extent with its suffruticose habit, it would still, no doubt, preserve its charming leaves and bewitching flowers."

EARLY ROSES IN POTS.

By HARRY G. MOUNT, F.R.H.S.

My object is to explain as briefly and as clearly as possible the system practised by my firm at our Canterbury Nurseries in growing early roses, which commence to flower about the end of January or beginning of February.

To ensure getting good flowers in pots at this time of the year, the first consideration is to have well-ripened plants to start with, and plants that are also quite established in their flowering-size pots by the preceding late summer or early autumn. We usually use 8-inch pots, though a number are also grown in 7-inch pots, but the 8-inch are best if they are kept over for a number of years.

Some of the plants may be ten years old or more, though of course the worst ones are being continually thrown away and young stuff grown on to take their places ; but while a plant is healthy and vigorous no particular notice is taken of the age of it.

We commence the season's work by getting the plants into the greenhouses from the outside beds where they have been standing all the summer, about the first week in October. If they should be at all wet or sodden by autumn rains at this time of the year, they are not watered until the soil gets moderately dry again. This, under most circumstances, should not take more than a week or so, and then they are turned out of the pots so that the crocks for drainage may be put in good order and worms discovered.

We then put them back again into the pots and take off all the old sour soil from the top to the depth of about half an inch or so, and top-dress the plant with good loam mixed with a little horse manure and bone flour, or something similar. This top-dressing is put on and well rammed down, leaving a space of about a quarter of an inch from the top of the pot for watering. This we find enough for this time of the year, as they do not require much water at this season, though later on this top-dressing gradually gets washed out, and it is possible to give them more water by the time they begin to require it.

Top-dressing is done before the roses are pruned, and during all the month of October full air is kept on the plants night and day. They may require watering several times if the weather is fine during this month, but of course everything depends on the weather at this time of the year as far as watering is concerned.

By the end of October the plants should be beginning to have all the eyes well plumped up ready for pruning, just as outdoor plants would be by the end of a warm February or early March. We usually commence pruning early in November, and prune roughly to within 6 inches of the top of the pots, though of course this is only an approximate

length. Some plants may have to be pruned a bit harder and some less, but if possible get a good eye to prune to at this time of the year. After pruning it is most important to be careful with the watering, as of course there is practically nothing to water for a few weeks. If the weather is at all sunny, full air should still be kept on during the day and some also at night, but again everything will depend on the weather.

On sunny days a good syringing in the morning with clear water, or with a little soap or insecticide in the water, will do good and help the plants to break, but it should not be done too late in the day, certainly not after mid-day all through November. Fire heat will probably not be required, as a temperature of 50° to 55° will be enough, and if it should go below this no harm at all will be done yet. When December comes the plants should have shoots from half an inch to an inch long and they will now require fire heat to help them along.

Of course up till now they have been practically growing naturally, but if let alone now they will soon stop growing and begin to rest for the winter. Now is the time to commence giving them fire heat, and the temperature should not fall below 50° to 55° at night during ordinary weather. If the outside temperature should, however, become very low, a temperature of 45° to 48° would not hurt at all, though the plant would be somewhat slower in growing. If the temperature should go much below 45° , say to 35° to 40° , the roses would probably stop growing for some little time and they would not flower by early February, though even then, if they have not been kept at too high a temperature earlier in the season, no harm would really come to them beyond retarding the time of flowering.

Air should be given every day if possible, but as the foliage begins to grow it is most important that no cold draughts should strike directly on to it. If cold draughts are allowed, mildew will probably make its appearance in a day or so, and if allowed to get a firm hold it will be a very difficult matter to get rid of it.

In the matter of ventilation, trade growers will probably always have the advantage over amateurs. It is so necessary to be always on the watch for changes of wind and temperature, and unless some one is on duty there is the chance of a sudden change in the weather upsetting all the best-laid plans. As far as possible we keep our temperature at about 55° to 60° during the day, and at 50° to 55° at night. During this time of the year and right up to the end of March the ventilation may require altering twenty times a day. Where it is impossible to give due attention the best thing to do is to keep the plants on the hardy side—that is, have plenty of ventilation and not too high a temperature right from the start.

If the roses are doing well they will not be troubled a great deal by green fly or anything else in the way of insects, but they will probably require fumigating with some nicotine preparation about once a month. Do not wait until the attack is bad before fumigating, but have it done

as soon as any attack is noticed. We usually have to fumigate twice before Christmas.

When the shoots begin to show signs of buds we give them a slight feeding of some manure dissolved in the water, and usually water them with this about once a week, but if the weather is very dull it may not be possible to do so quite so often. We always like to have one watering with clear water between each watering with manure.

We do not use any one particular manure or only one, but change about with Clays', Bull's, and Renny Forbes' complete manures, and also give the plants a little soot, sulphate of ammonia, sheep manure, Peruvian guano, and a certain amount of lime. This seems a very formidable list, but it is really not so, and probably if we kept to one or two we should get the same results; but manure merchants have a way with them, and we try to oblige them by giving them orders now and again.

We really do not give the plants a great deal of manure, and it is only waste of money to give them more than is necessary. We often find it a good plan to withhold it altogether during the time of flowering if the colour should be at all poor. Another way to improve the colour, if it is not all that it should be, is to reduce the temperature for a few days by about 5°, but this must not be overdone or the plants will be checked too much.

During the growing period the plants may be syringed whenever the weather is favourable but this operation must be done with extreme care during the very dull time of late December and January, and of course not too heavily. The foliage should be quite dry again by the afternoon, and if it is not dry by this time of the day it would be better to shake the water off gently, so that the foliage will not be cold and wet at night. It is quite possible that right in the middle of winter a favourable opportunity for syringing would not occur for a month or more, and if the hot-water pipes were kept very hot during this period an attack of red spider would probably result. We find the best thing to clear red spider is a good strong syringing right under the foliage with a hose-pipe and a nozzle that points upwards at right angles to the spray rod. This will clear the spider right off, and if done on a sunny day the foliage is soon dry again. The same thing can be done on a small scale with an Abol syringe, and of course an insecticide can then be used to spray them with.

The worst enemy to guard against in growing roses under glass, in my opinion, is mildew, and this can generally be kept away by correct ventilation. A good preventive is the old one of smearing sulphur on to the hot-water pipes, and if too much is not put on it is a good plan to have a little always kept on the pipes; a patch about a foot long in every twelve feet or so of piping should be ample; it should of course, be on the flow pipe, not on the return. Campbell's fumigators are also very good, but we find it better to use these little and often than to use them too much at a time.

Green fly is now practically no trouble at all, owing to the many

nicotine compounds on the market. Red spider may be troublesome, but it is generally a sign of neglect if it is allowed to get bad.

Black spot is a very bad disease if it appears at all, and certain varieties are more subject to it than others, but if it is remembered that a close, confined atmosphere, with a rather high temperature during the day and a close atmosphere and low temperature at night, will almost certainly cause it to appear, it will be easy to avoid it by avoiding the conditions necessary for its appearance. If a bad attack should come about, really the best thing to do is to throw the plants away, or anyhow to give up all idea of saving that particular crop, and to try to get some growth on for the next crop.

Ample ventilation, a fairly warm temperature, and cutting off of all diseased shoots will probably be sufficient to get rid of the disease if the treatment afterwards is correct; but, as I have already said, if the attack is bad it is almost hopeless to expect to save the current crop of flowers.

After the plants have flowered and the flowers are cut off, they will require to be kept well syringed and to be fed up again to induce the second crop of flowers, and the treatment is very similar to that already detailed. The only thing to remember is that the days are now longer and probably much warmer under glass, and that the plants will require rather more watering and syringing. This is a usual time to get an attack of red spider, and care should be taken to check it immediately it appears. Of course the soil will require stirring up slightly now and again during the growing period, say about once a month or six weeks, but not very deeply—only just enough to loosen the top and to get rid of any weeds. The second crop will be in flower about April, and the third about the end of June. After this we usually stand our plants outdoors in the full sun on a well-drained piece of ground, and let them stay there until it is time to bring them in again by October. During the summer they will require a good deal of water, but we do not plunge them up in ashes or anything, as we find they ripen the wood better if left standing open. It is rather more trouble, but the results seem to us to repay it.

If it is not possible to get the roses into the greenhouse as early as October, they can be brought in at any time up to the end of January, but after November they are better pruned as soon as possible and left to come along slowly, though it is not advisable to prune or top-dress them if the soil is too wet. They should always be left to get moderately dry before doing anything to them.

We may thus summarize our methods: Roses under glass require a well-ventilated house, with plenty of ventilation at the start; a temperature of about 55°; not too much watering during the winter, though plenty during the spring and summer, and the same with syringing; a fair amount of manure, which is easily given to them in the water, and special attention to mildew, and in a lesser degree to green fly and red spider.



FIG. 35.—*GERANIA LANCHOII*, DUMMER

(To face p. 208)

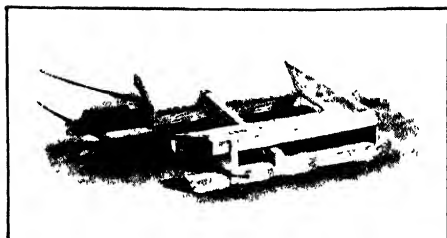


FIG. 56. THE WISELY TURNIP-FLY TRAP



FIG. 57.—THE WISELY TURNIP-FLY TRAPS IN USE
Three rows on right treated two days before those in middle of figure

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXIII.—A TRAP FOR TURNIP-FLY.

By Prof. H. M. LEFROY, M.A., F.Z.S., Entomologist.

THE Turnip-Fly or Turnip-Flea Beetle is a well-known pest of turnips, swedes, cabbages, and allied cruciferous plants in the seedling stage. The commonest form is a minute bluish beetle, which in fine sunny weather is seen sitting on the little seedling plants, and which eats small round holes in the leaves. The beetles attack plants in all stages, and may be found eating holes in the leaves of the full-grown plants, but their destructive power is mainly exercised on the first two leaves of the plants as they come out of the ground, or on the first rough leaves which follow them. At this stage the plant is wholly dependent on its leaves, any injury to which results in a serious set-back to its growth. Later on the injury these small beetles cause is of much less importance, as the large leaf surface is sufficient for the plant, and the small holes made by the beetles do not reduce the leaf-area greatly.

At Wisley, as elsewhere, turnips were sown in August with a view to the winter food supply, and the seedlings were heavily attacked, mainly by the blue flea-beetle (*Phyllotreta consobrina*), and also, but to a lesser degree, by the yellow-striped form (*P. undulata*). The seed was drilled in rows a foot apart, and the young plants became infested from a neighbouring plot of broccoli. It was observed that, when the flea-beetles were disturbed they leapt outward from the plants, alighting about midway between the rows. It seemed clear that, if, instead of the soil, one could place a sticky layer for the beetles to alight on, many would be caught. Acting on this idea, the trap now to be described was devised.

A rough pattern was made, coated with vaseline, and tested on three rows of the plot. Two days elapsed and these three rows made such extraordinary growth, as compared with the rest of the plot, that further trials were made. It was evident that the beetles were being caught, as they were there in the vaseline in scores, but the results were more striking than had been expected.

As a result of further trials the following seems to be the best pattern of trap :—

The trap consists of two boards set at a slope on a pair of runners, like those of a sledge or toboggan, with a space between. The trap is drawn along the drill, so that the plants pass down the space in the middle. In order to disturb the beetles, a loop of string hangs from a cross-bar and brushes the plants.

Disturbed thus, the flea-beetles leap away sideways, alight on

the sticky boards, and perish. In this way the beetles can be collected from the plants, and the amazing results are due apparently solely to the growth the seedlings make when their leaf surface is entirely unharmed.

The trap is easily made from light wood ; the illustration (fig. 56) and the following instructions show the details of its construction :—

To a frame made of six pieces of half-inch deal 20 inches long two pieces of thin board (20 inches by 5 inches) are fixed so as to slope outwards and upwards on the sides of the frame. These sloping boards are held apart by a cross-bar and an end piece, so as to have four clear inches between them at the bottom. The two bottom outer pieces of the frame are made half-inch deeper than the inner pieces, the whole trap riding on the outer pair as a sledge on runners. The ends are rounded off to allow free running. The sloping boards, the end pieces facing them, and the cross piece between them are greased. From the cross-bar between the sloping pieces hangs a loop of stout string, and strings four feet long are attached to the front top corners.

If the trap is drawn down each row of turnips so that the young plants pass under the cross-bar and are brushed by the string loop, the beetles leap up and alight on the sticky boards. There they perish.

If made of deal, this apparatus is so light that a child can draw it along the rows ; it is better for two persons to draw the trap, and for them to walk a few feet away on each side, so that the beetles are not disturbed until the sticky boards reach them. If two persons are not available, one can work the trap, drawing it with outstretched arm, and walking so that the shadow falls on rows already done.

The cost of the trap lies between two shillings and half-a-crown, and steps were at once taken to make the trap available to those who wished to purchase it ready-made.

In the experiments vaseline was first used, but was found to melt too readily under the hot sun ; other substances used with success were Morlar Hop wash (the pure undiluted wash), Wood & Sons' smearing grease, and black currant mite grease. Many other substances may probably be used, and it is only important to have a material that remains sticky and is not so tacky as to let the beetles jump off before they sink into it.

The trap as figured here does one row at a time : obviously a trap of the size described is suitable only for garden use, but the principle can probably be applied to field use by making a multiple trap based on the width of one of the drills. We have as yet had no opportunity of testing any pattern on a larger field scale.

A remedy in use against Turnip-Fly has been to drag a tarred board over the field, but this is open to the objections that it damages the plants and that the tar soon becomes covered with dust and earth. The sloping board principle, with runners, does away with both these objections.

As turnips have been widely sown during August and September to provide for a possible food scarcity, a description of this trap was circulated to the gardening papers as soon as it was seen to be successful. We have to thank Messrs. Wood & Sons for the assistance they gave and for the illustration (fig. 56) which appears here, which was sent to the gardening papers with our leaflet. Fig. 57 shows the three rows first treated on the right and then the rows not treated till later, with the trap standing in the first untreated row.

AQUILEGIA TRIAL, 1914.

FORTY-TWO stocks of seed were received, and all were sown on April 9, 1913, and planted out on deeply trenched ground on June 7. All the plants made excellent growth, and were examined by the Floral Committee on May 26, 1914. Unfortunately there was a sharp frost on the same morning (20° F. on the grass), injuring the blooms somewhat, and followed by a still sharper frost on the morning of the 27th (19° F. on the grass). This killed all the blooms that were open and most of the advanced buds, but later on a second growth was made, and a good crop of flowers was produced, but small as compared with the first.

There is probably no flower that is so difficult to get true from seed as the *Aquilegia*, and nearly all stocks showed a considerable amount of variation.

- | | |
|--|---|
| *1. <i>Skinneri hybrida flore pleno.</i> | 22. <i>coerulea.</i> |
| 2. <i>baicalensis.</i> | 23. <i>canadensis</i> 'Turk's Cap.' |
| 3. <i>Haylodgensis delicatissima.</i> | 24. Giant Blue and White. |
| 4. Long-spurred White. | 25. Grey Friar. |
| 5. <i>chrysantha.</i> | 26. Long-spurred Hybrids. |
| 6. <i>erecta nana atrocoerulea</i> | 27. White Queen. |
| <i>plenissima.</i> | 28. <i>alba plena.</i> |
| 7. Long-spurred Hybrids. | 29. Uppingham Red. |
| 8. <i>coerulea hybrida.</i> | 30. Spurless Strain or Clemat- |
| 9. Rose Queen. | <i>aquila.</i> |
| 10. <i>chrysantha</i> selected. | 31. } Long-spurred Hybrids. |
| 11. Long-spurred Yellow. | 32. } |
| 12. <i>Vervaeaneana.</i> | 33. <i>superba.</i> |
| 13. <i>californica</i> (selected). | 34. <i>coerulea</i> 'White Lady.' |
| 14. <i>coerulea.</i> | 35. <i>glandulosa.</i> |
| 15. New Rose shades. | 36. Double White Quilled. |
| 16. New Hybrids. | 37. <i>coerulea hybrida</i> 'Mrs. M. |
| 17. Long-spurred Hybrids, 'Mrs. | Nicholls.' |
| Elliot's Strain.' | 38. Long-spurred Choice Mixed. |
| 18. Long-spurred Hybrids. | 39. Long-spurred Hybrids. |
| 19. <i>Helena.</i> | 40. <i>glandulosa vera.</i> |
| 20. <i>californica hybrida.</i> | 41. <i>caryophylloides flore pleno.</i> |
| 21. <i>Skinneri.</i> | 42. Munstead White. |

F.C.C. = First-class Certificate.

A.M. = Award of Merit.

XXX = Highly Commended.

XX = Commended.

* The number preceding the name is that by which the stock was alone known at Wisley until judging had been completed.

The date of the maximum number flowering is given in each case.

28. *alba plena* (R. Veitch).—Erect, 30–40 inches; flowers borne on rather stiff pedicels, double, short-spurred, white. The yellowish buds give a creamy appearance to the mass of flowers. May 24.

2. *baicalensis* (R. Veitch).—A strain varying in height from 14 to 42 inches. Flowers short-spurred, in various shades of blue. May 25.

20. *californica hybrida* (R. Veitch), **F.C.C.** June 5, 1877.—A mixture of the type and its double form. The latter is unattractive. For description of the type see No. 13. June 8.

13. *californica* selected (Barr).—18–30 inches. Sepals and spurs dull Tyrian rose; petals picric yellow to cream. Spurs equal to, or slightly less than, the sepals. The stock is variable in height, and there are about 10 per cent. rogues. May 24.

23. *canadensis* 'Turk's Cap' (Barr), **XXX** May 26, 1914.—12–15 inches; stems ribbed, reddish; leaves deep green, often reddish; flowers pendulous, small, orange-scarlet; sepals scarlet; petals small, scarlet, with bright lemon-chrome throat; spurs half sepals and of the same colour. The stock is true. A most attractive little plant, very well suited to the rockery. May 25.

41. *caryophylloides flore pleno* (R. Veitch).—A strain of plants not exceeding 24 inches in height, and bearing pale double flowers on a loose inflorescence. May 25.

5. *chrysantha* (R. Veitch).—36–40 inches; inflorescence lax, flower lemon-yellow, with paler sepals; spurs long and spreading. June 20.

10. *chrysantha* selected (Barr).—Identical with No. 5.

14. *coerulea* (Barr), **F.C.C.** May 16, 1865.—18–24 inches. Very variable stock, ranging from almost pure white to entirely blue flowers. About 10 per cent. of the type No. 22. May 25.

22. *coerulea* (R. Veitch), **F.C.C.** May 16, 1865.—15–20 inches; stem reddish, pubescent; flower 2½ inches in diameter; sepals broad, lavender-violet; petals open, spreading, white with distinct veins; spurs almost straight, exceeding the sepals and of the same colour. May 25. The stock requires selection, being only 10 per cent. true.

8. *coerulea hybrida* (R. Veitch), **F.C.C.** June 5, 1877, **XXX** May 26, 1914.—18–36 inches. A strain with long-spurred flowers of various delicate, white, rose, and blue shades, although few have broad sepals. May 24.

37. *cocrulea hybrida* 'Mrs. M. Nicholls' (R. Veitch).—A pretty form of *coerulea* having light wistaria violet sepals and white petals tinged with blue. Stock requires further selection. May 25.

34. *coerulea* 'White Lady' (Barr), **XX** May 26, 1914.—18–24 inches. A long-spurred, free-flowering white. The stock is very true for height and colour, but the spurs are very variable in length. May 25.

36. Double White Quilled (R. Veitch).—Failed.

6. *erecta nana atrocoerulea plenissima* (R. Veitch).—A strain of dwarf plants, varying from 12 to 18 inches, bearing their flowers erect in a head. About 5 per cent. are single, the remainder are double. The flowers vary in colour from white through rose and blue to deep purple. May 20.

24. Giant White and Blue (Barr).—30–36 inches; rather sparse-flowering. There are several forms and several shades of blue, blue with white petals, and a few with entirely white flowers. May 24.

35. *glandulosa* (Barr).—9–12 inches; few flowered; flowers deep soft blue-violet, abruptly passing to white at the middle of the petals. Spurs short, incurved. May 18.

40. *glandulosa vera* (R. Veitch).—Identical with No. 35.

25. Grey Friar (Bartleet).—An erect-growing variety, 24–30 inches; flowers white, tinged with soft lavender-blue; spurs short. About 10 per cent. are deep bluish-violet. May 25.

3. *Haylodgensis delicatissima* (R. Veitch), **XX** May 26, 1914.—Stems reddish, about 24 inches; sepals rose-pink, rather narrow; petals cream, becoming white as the flower ages; spurs rose-pink, exceeding the sepals, straight. About 75 per cent. true. May 25.

19. *Helenae* (R. Veitch).—24–30 inches; stems dark-coloured, flowers of varying dull blue shades; spurs short; not very free. Poor. May 25.

38. Long-spurred Choice Mixed (Carter).—A long-spurred strain, with rather small flowers. 18–24 inches. May 22.

39. Long-spurred Hybrids (R. Veitch).—Only seven plants raised. Four were long-spurred, yellow-flowered; one was *A. chrysantha*, and the remaining two had white, short-spurred flowers.

32. Long-spurred Hybrids (Dobbie), **A.M.** June 8, 1909.—A strain of long-spurred forms. The colours are good. The plants varied from 24 to 36 inches, and were in full flower on May 25.

31. Long-spurred Hybrids (Dickson & Robinson).—A strain very variable in height and in the pale flowers; the spurs do not exceed, and are often shorter than, the sepals. June 22.

7. Long-spurred Hybrids (Sharpe).—A mixture consisting of plants bearing flowers of red and yellow shades. They are apparently forms of *californica* and *chrysantha*. May 25.

18. Long-spurred Hybrids (F. Simpson), **XXX** May 1914.—24–30 inches. A long-spurred strain. The colours are clear, and a large percentage of the plants bear large flowers with broad sepals. May 24.

26. Long-spurred Hybrids (J. Veitch).—15–24 inches. A long-spurred strain, but not very free-flowering. A form with rose sepals and yellow petals predominates. May 25.

17. Long-spurred Hybrids, 'Mrs. Elliot's Strain' (R. Veitch).—A long-spurred strain, very variable in height and containing a number of inferior forms. May 25.

4. Long-spurred White (Dobbie).—24–30 inches. The flowers

are large, and the long spurs often tinged with rose. The stock required considerable selection. May 23.

11. Long-spurred Yellow (Dobbie).—A good form of *chrysantha*. See No. 5.

42. Munstead White (Barr), **XX** May 26, 1914.—An erect-growing, free-flowering, short-spurred white; 30 inches. The stock is very true. May 24.

16. New Hybrids (Sydenham).—A good, long-spurred strain. The flowers are of delicate and clear colour, with long spurs. In many cases the sepals are broad. 20-30 inches. May 25.

15. New Rose shades (Barr), **XXX** May 26, 1914.—A strain bearing long-spurred flowers. The sepals range from rose to amaranth-pink, with white or yellow petals. There are several very pleasing forms, but the stock requires selection. 20-30 inches. May 24.

9. Rose Queen (R. Veitch).—Stems reddish, 20 inches; sepals pale amaranth-pink; petals cream, becoming white as the flower ages; spurs equal to sepals and of the same colour. About 20 per cent. true. May 25.

21. *Skinneri* (R. Veitch).—Stems deep red, ribbed, glandular, pubescent; 30-36 inches; flowers yellow, with long scarlet spurs and narrow green sepals. A well-known species. June 28.

1. *Skinneri hybrida flore pleno* (R. Veitch).—A small, rather dull-coloured double, varying in height from 14 to 36 inches. About 80 per cent. true; the remainder consisted of the single type No. 21.

30. Spurless Strain or *Clemataquila* (Kelway).—Stems green to reddish. 36-48 inches; flowers without spurs, more or less double, in varying shades of violet-blue and purple. June 10.

33. *superba* (Dobbie).—The plants vary in height from 24-26 inches, and are apparently seedlings of *A. californica*, which species the flowers closely resemble. They are rather better than the type (No. 13). The stock requires further selection.

29. Uppingham Red (Barr).—The stems are 25-36 inches high, reddish; sepals yellow, suffused with rose; petals long, not spreading, lemon-yellow; spurs equal to the sepals, with incurved points. The variety bears a strong resemblance to *A. californica*. The stock is quite true. June 10.

12. *Vervaeaneana* (R. Veitch).—This is a form of *A. vulgaris*, having the foliage mottled with yellow. The flowers are double, and of various blue and purple shades. 30 inches. About 60 per cent. of the stock is true. May 25.

27. White Queen (Barr).—A variety with reddish buds that open to a small creamy-white flower with long spreading spurs. Not attractive. Height 24-36 inches. June 13.

PENTSTEMONS AT WISLEY, 1914.

REPORT BY MR. C. C. TITCHMARSH, Trials Officer.

YOUNG plants (established cuttings) of one hundred and forty-seven stocks, representing one hundred and thirty-six varieties of Pentstemons, were received at Wisley during the spring of this year. They were placed in cold frames until the first week in April, when they were planted out—two feet apart—on ground that had been manured and trenched in the previous autumn.

The cultivation of the plants has been carried out under the direction of the Superintendent, Mr. S. T. Wright, to whom the Trials Officer is indebted for constant help and advice in preparing the material for this report.

Of the varieties sent from Germany, some did not survive the effects of their journey, and could not, therefore, be included in the Trial.

The plants made excellent progress, and were judged by a sub-committee of the Floral Committee on July 31, which recommended the awards recorded below.

Very considerable resemblance appears to exist between many varieties. Inasmuch as some stocks received were much more advanced than others, and since they maintained that advantage throughout the flowering season, it has been impossible to decide finally questions of synonymy. Cuttings of all varieties will be taken and the plants grown under identical conditions next year. A further report will then be made.

Florists' Pentstemons appear to be descended, for the most part, from *P. Cobaea* and *P. Hartwegii* (*P. gentianoides*), the influence of the latter species being particularly evident in the varieties of the 'Southgate Gem' type.

The varieties vary but little in general habit, the main differences between them lying in the shape and coloration of their flowers. It may be noted that, as is so often the case, red or reddish pigmentation of the vegetative parts is associated with the fuller colours—reds or purples—and greenness (lack of anthocyan pigmentation) with pale shades. The flowers are usually pendulous, but in some cases are held above the horizontal; the corolla is bi-labiate, its length may be greater than, equal to, or less than its width at the mouth; the throat is normally compressed, but in some cases it is very open, giving the flower an almost regular appearance, in which case there is usually an addition to the normal number—five—of the corolla segments. The contours of the three segments of the lower lip are usually each equal to or less than a semicircle, occasionally they

approach two-thirds of a circle. The upper stamen is usually modified to a staminode, its free end resting on the inner edge of the lower lip. The terminal flower is frequently monstrous. The colour may be spread partly or completely over the outside of the corolla tube, either terminating sharply on the inside of the lips or diffusing into the throat; there is frequently dark blotching on the lower lips and lines running down the corolla tube.

In the following descriptions, where no mention is made of the mouth or inside of the tube, the absence of blotching and lines is indicated. Where a variety does not vary from the usual height of 25-30 inches, no special reference is made to its stature.

The numbers and letters, *e.g.* (69 i), following the colour name refer to "Colour Standards and Colour Nomenclature," Ridgway.

FREDERICK KEEBLE, F.R.S., Director.

The Committee selected the following as the best in the trial:

<i>Purple.</i>	<i>Rose (light shades).</i>
'Admiral Togo'	'Gertrude Saunders'
'Alexander Wood'	'Jane Dieulafoy'
'Clorinda'	
'Fair to See'	<i>Rose Red.</i>
'Gay Garland'	'Crimson Gem'
'Lady Sybil'	'Mrs. Fred. Fulford'
'President Carnot'	'Mrs. P. S. Hayward'
	'Phryne'
<i>Rose (deep shades).</i>	'Rosamund'
'Aldenhams Pride'	'Sportsman'
'James Douglas'	
'Margarete Bader'	<i>Scarlet.</i>
'Mrs. A. C. Sweet'	'Southgate Gem'
'The Gift'	
'Tweed'	<i>White.</i>
'Virgil'	'Seagull'

A.M.—Award of Merit.

XXX—Highly Commended.

133. Adjutant Vincenot (Dobbie).—Corolla $1\frac{1}{2}$ in. long and wide; throat compressed; rose red (71), extending over the whole of the outside of tube, but paler below; diffuse on lower lip; heavy blotching in the throat, lines inside the tube.

10.* Admiral Togo (Cutbush), **A.M.** July 31, 1914.—Habit erect; corolla $1\frac{1}{2}$ in. long and wide; throat open; aster purple (69i), extending over the whole of the outside of the tube, sharply defined on lower lip.

* See footnote, p. 272.

132. African (Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat compressed; rhodamine purple (67), extensive on outside of tube, diffuse on lower lip; throat very heavily blotched, lines inside the tube. This variety had the heaviest throat-blotching of any in the trial.

11. Agnes (Cutbush).—Rather procumbent; corolla $1\frac{1}{2}$ in. long, wider than long; throat vertically compressed; rose red (71a), extending over the whole of the outside of the tube, sharply defined on lower lip.

65, 125. Agnes Wickfield (Barr, Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat open; white, lightly coloured on the lips with Tyrian rose (70c).

101. Aldenham Belle (Gibbs).—Corolla $1\frac{1}{2}$ in. long and wide, almost regular, staminode imperfect; carmine (1a), extending over the whole of the outside of the tube, sharply defined on lower lip.

5. Aldenham Pride (Cutbush), A.M. July 31, 1914.—Compact, 24 inches; corolla $1\frac{1}{2}$ in. long, wider than long; throat little compressed; rose (71c), slight on the tube, diffusing on lower lip to heavy blotches; inside tube lined.

50. Alex. Mitchell (Cutbush).—Inflorescence rather loose; corolla $1\frac{1}{2}$ in. long, longer than wide; throat open; deep spectrum red (1h), extending over the whole of the outside of tube, sharply defined on lower lip.

128. Alex. Wood (Dobbie), A.M. July 31, 1914.—Corolla $1\frac{1}{2}$ in. long, longer than wide; throat compressed; amaranth purple (69i), extending over the whole of the outside of tube, passing into very heavy blotches in the throat; inside tube lined; lips bluntly pointed.

25. Arethusa (Cutbush).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat little compressed; magenta purple (67'h), extensive on outside of tube, diffuse on lower lip; a heavy blotch of dahlia purple in the throat; (67k); lines inside tube.

107. Atlantis (Dobbie).—A mixture: two were 'Agnes Wickfield' (q.v.), the other was a purple-flowered plant.

112. Attraction (Dobbie).—Corolla $1\frac{1}{2}$ in. long and wide; throat open; Tyrian pink (69b), extensive on outside of tube, diffuse on lower lip; throat heavily blotched; lines inside tube.

46. Autumn Cheer (Cutbush).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat compressed; light rose red (71a), extending over the whole of outside of tube, diffuse on lower lip; throat blotched; lines inside tube.

119. Baden Powell (Dobbie).—Corolla $1\frac{1}{2}$ in. long and wide; throat compressed; pomegranate purple (71i), extending over the whole of the outside of tube, diffusing on lower lip, lines inside tube.

91. Bernhard Wilhelm Kuhn (Pfitzer).—Corolla $1\frac{1}{2}$ in. long, $2\frac{1}{2}$ inches wide; throat open; rose (71b), slight on outside of tube, sharply defined on lower lip.

26, 103. Bianca (Cutbush, Gibbs).—Height 31 inches; rather scanty flowerer; corolla $1\frac{1}{2}$ in. long, wider than long; throat open; creamy white, with a rosy flush on the lips.

21. Bonnie Lass (Cutbush).—Weak ; corolla $1\frac{1}{8}$ in. long, wider than long ; throat open ; rose red (71), diffuse on lower lip ; throat blotched ; tube white inside and out.

99. Bonnie Lass (Gibbs).—Corolla $1\frac{1}{8}$ in. long, longer than wide ; throat very open ; Tyrian rose (69), slight on outside of tube, diffuse on lower lip ; tube slightly lined.

19. Born in the Purple (Cutbush).—Corolla $1\frac{1}{8}$ in. long and wide ; throat irregular ; light rose red (71 a), blotched on outside of tube, sharply defined on lower lip ; throat a little blotched. The lips spread very little in this variety.

24. Bronze Lass (Cutbush).—Habit erect, with rather small flowers ; corolla $1\frac{1}{2}$ in. long, wider than long ; throat compressed, colour light rose red (71), extensive on outside of tube, diffuse on lower lip ; throat blotched and light lines in the tube.

124. Bute (Dobbie).—Corolla $1\frac{1}{4}$ in. long, just exceeded by its width ; throat vertically compressed ; rose red (71), extensive on outside of tube, passing from the lower lip into heavy blotches in throat and lines in inside of tube.

29. Cassandra (Cutbush).—Height 24 inches ; corolla $1\frac{7}{8}$ in. long, wider than long ; throat open ; rhodamine purple (67 h), extending over the whole of the outside of tube, diffuse on lower lip ; throat lightly blotched.

70. Charming (Barr).—Corolla $1\frac{1}{2}$ in. long and wide ; throat open ; white, flushed rose red (71) on lips ; lower lip waved, deeply lobed.

75. Chinoiserie (Barr).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat compressed ; rhodamine purple (68 a), slight on tube, diffuse on lower lip ; blotched in throat and lined in tube.

18. Cleopatra (Cutbush).—Inflorescence heavy ; corolla $1\frac{5}{8}$ in. long, wider than long ; throat compressed ; amaranth purple (69 i), extending over the whole of the outside, diffuse on lower lip ; throat blotched ; lines in tube.

17. Clorinda (Cutbush), **XXX** July 31, 1914.—Corolla $1\frac{1}{2}$ in. long, much wider than long ; throat open ; rhodamine purple (67 a), extensive on outside of tube and sharply defined on lower lip.

71. Constance (Barr).—Compact, 24 inches ; corolla $1\frac{3}{4}$ in. long, longer than wide ; throat compressed ; rose (71 c), extending over the whole of the outside of tube, sharply defined on lower lip, lines inside of tube.

137. Constance (Dobbie).—Corolla $1\frac{5}{8}$ in. long and wide ; throat open ; rose (71 b), slight on tube, diffuse on lower lip ; blotched in throat ; inside tube lightly lined.

129. Cornet Scott (Dobbie).—Height 23 inches ; corolla $1\frac{1}{2}$ in. long, wider than long ; throat very open ; light rose red (71 a), slight on tube, sharply defined on lower lip, light blotches in throat and lines in tube. The flower is almost regular ; there is usually an increase in the number of lip segments, and the staminode is imperfect.

66. Countess of Hopetoun (Barr).—Compact, 16 inches high ; corolla $1\frac{1}{2}$ in. long and wide ; throat open ; deep rose pink (71 d),

extending over the whole of the outside of tube, diffuse on lower lip ; inside tube rather thickly lined. This variety should be useful for breeding purposes on account of its compact and free-flowering habit.

72. Countess of Strathmore (Barr).—The habit and form of 'Constance' (No. 71), but with white flowers ; flowers of good form.

80. Crimson Bedder (Simpson).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat little compressed ; deep rose red (71), extending over the whole of the tube, diffuse on lower lip ; throat very heavily blotched ; heavy lines inside tube.

34, 97. Crimson Gem (Cutbush, Gibbs), **A.M.** July 31, 1914.—Corolla $1\frac{1}{2}$ in. long and wide ; throat compressed ; rose red (71), extending over the whole of the outside of the tube, but streaked with white ; passing from lower lip into very heavy blotches in throat ; heavy lines in tube.

145. Crown Prince (Hayward).—A variety closely resembling 'Southgate Gem,' but its throat has rather less striping, and it is hardly so free-flowering.

115. David McConnochie (Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat compressed ; amaranth purple (69 i), extending over the whole of the outside of tube, diffuse on lower lip ; blotched in throat and lined in tube.

40. Day Dream (Cutbush).—Indistinguishable from 'Gertrude Saunders.'

105. Devonian (Godfrey).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat vertically compressed ; deep rose red (71 h) extending over the whole of the outside of the tube, diffuse on lower lip, inside of tube lightly lined.

39. Distinction (Cutbush).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat vertically compressed ; pomegranate purple (71 i), extending over the whole of the outside of the tube, passing to spectrum red (1) on the lower lip, and through a bluish ring to heavy throat blotches and lines in the tube. The only variety with this combination of colours.

113. Dr. Chantimesse (Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat vertically compressed ; colour rose (71 b), slight on the tube, sharply defined on lower lip.

23. Dr. Webb (Cutbush).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat open ; rose pink (71 d), very slight on tube, sharply defined on lower lip.

56. Emile Rodigas (Lapworth Co.).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat open ; rose red (71), extending over the whole of the outside of the tube, sharply defined on lower lip ; inside tube lightly lined.

7. Exquisite (Cutbush).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat little compressed ; phlox purple (65 a), very sharply defined on lower lip.

22 Fair to See (Cutbush), **A.M.** July 31, 1914.—A variety very like 'Chinoiserie,' but the inside of the tube is more heavily lined.

95. Feuerwerk (Pfitzer).—Corolla $1\frac{1}{2}$ in. long, wider than long throat compressed ; very deep rose red (71), extending over the whole of the outside of the tube, diffuse on lower lip ; lines inside tube.

81. Fräulein Elise Spieth (Pfitzer).—Corolla $1\frac{1}{2}$ in. long, equal to its diameter ; throat vertically compressed ; whole flower creamy to white, often tinged with rose ; lower lip deeply lobed ; staminode imperfect.

88. Fräulein Emmeline Lampert (Pfitzer).—Corolla $1\frac{1}{8}$ in. long, wider than long ; throat open ; rose red (71), slight on the tube, diffuse on lower lip ; throat blotched with purple ; lines inside tube.

93. Fräulein Johanna König (Pfitzer).—Corolla $1\frac{1}{8}$ in. long, wider than long ; throat very open ; rhodamine purple (67 h) very slight on tube, sharply defined on lower lip.

86. Fräulein Paula Bosch (Pfitzer).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat open ; pansy purple (69 k), extensive on the tube, sharply defined on lower lip ; lower lip somewhat deeply lobed.

92. Fräulein Rosa Weidlin (Pfitzer).—Corolla $1\frac{1}{2}$ in. long, wider than long ; throat open ; white, the margin of lips tinged with violet.

4. Gay Garland (Cutbush), A.M. July 31, 1914.—Corolla $1\frac{1}{8}$ in. long, wider than long ; throat little compressed ; rosolane purple (69' j), diffuse on lower lip ; blotched in throat.

1. Gertrude Saunders (Cutbush), XXX July 31, 1914.—Height 20 inches ; corolla $1\frac{1}{2}$ in. long, wider than long ; throat open ; flushed rose red (71) to rose pink (71 d) ; colour sharply defined on lower lip, which is somewhat deeply lobed.

52. Grenadier (Cutbush).—Corolla $1\frac{1}{8}$ in. long, much wider than long ; throat open ; very deep rose red (71), extensive on tube, diffuse on lower lip, very heavy lines in tube.

36. Helen of Troy (Cutbush).—Corolla $1\frac{3}{4}$ in. long and wide ; throat open ; rose red (71), extending over the whole of the outside of the tube, diffusing as a fringe on lower lip ; staminode imperfect. A bold flower, approaching the shape of a Foxglove.

2. Hercules (Cutbush).—The flowers are a trifle larger and the inflorescence more lax than those of 'Gertrude Saunders,' but otherwise identical with that variety.

20. Hon. Alban Gibbs (Cutbush).—Corolla $1\frac{1}{8}$ in. long and wide ; throat irregular ; rose red (71), extending over the whole of the outside of the tube, sharply defined on lower lip.

42. In Scarlet Array (Cutbush).—Inflorescence heavy ; corolla $1\frac{3}{4}$ in. long, wider than long ; throat compressed ; colour deep rose red (71), extending over the whole of the outside of the tube, diffuse on lower lip ; throat heavily blotched.

130. Ivanhoe (Dobbie).—A large, compact inflorescence ; corolla $1\frac{1}{4}$ in. long, wider than long ; throat open ; rose red (71), extensive on the tube, diffuse on the lower lip ; light blotches in throat ; lines inside tube.

60. James Douglas (Barr), A.M. July 31, 1914.—Erect, strong,

compact; a small-flowered but highly decorative variety. Corolla $1\frac{1}{2}$ in. long and wide; throat open; deep rose pink (71 d), extensive on the tube, sharply defined on the bluntly-pointed segments of the lower lip; inside of tube marked with coloured veins.

122. James Grieve (Dobbie).—Rather dwarf; corolla $1\frac{1}{2}$ in. long, wider than long; throat vertically compressed; rose red, slight on tube, diffuse on lower lip; inside of tube lightly striped.

62. Jane Dieulafoy (Barr), **A.M.** July 31, 1914.—Corolla $1\frac{1}{2}$ in. long, equal to its diameter; throat open; white, with a rosy margin and reverse to the lips.

111. Jessie Scott (Dobbie).—Height 20 inches. Corolla $1\frac{1}{2}$ in. long, wider than long; throat open; flushed rose red (71), lower lip somewhat deeply lobed.

53. J. H. Fuhrmann (Lapworth Co.).—A variety of distinct habit, best described as a rather large 'Newbury Gem' (*q.v.*).

73. J. M. Troupe (Barr).—Corolla $1\frac{1}{2}$ in. long and wide; throat compressed; aster purple (67 i), complete on the tube but paler below, sharply defined on lower lip, lightly blotched in throat and lined in the tube.

138. Kate Phillips (Dobbie).—Corolla $1\frac{1}{2}$ in. long, longer than wide; throat variable; rose (71 b), moderate on the tube, diffuse on lower lip; throat blotched; lines inside tube; margin of lip segments often serrate. The flowers are frequently large and inflated.

76. Kingston Beauty (Smith).—Corolla $1\frac{1}{2}$ in. long, longer than wide; throat compressed; spectrum red (1), extending over the whole of the outside of the tube, diffuse on lower lip; rather heavy lines in throat.

3. Lady Sybil (Cutbush), **A.M.** July 31, 1914.—Corolla $1\frac{1}{2}$ in. long, wider than long; throat little compressed; phlox purple (65 a), moderate on the tube, sharply defined on the lip; lip segments somewhat deeply lobed.

114. Lammermoor (Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat open; rose red (71), extending over the whole of the outside of the tube, diffuse on lower lip; throat blotched; lines inside tube. A large flower, with an undulate margin.

82. Lawrence Johnston (Pfitzer).—Corolla $1\frac{1}{2}$ in. long, longer than wide; throat compressed; very deep Tyrian rose (69), extending over the whole of the outside of the tube; blotchy below, passing on lower lip to a bluish ring.

89. Léon Delagrange (Pfitzer).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat open; rose red (71), extensive on tube, sharply defined on lower lip; blotched throat; tube lined.

37. Lord Charles Hope (Cutbush).—Corolla $1\frac{1}{2}$ in. long and wide throat small, compressed; spectrum red (1), extending over the whole of the outside of the tube, diffusing a little on lower lip; lines inside of tube.

134. Lord Shaw (Dobbie).—Corolla $1\frac{1}{2}$ in. long and wide;

throat compressed; light aster purple (67 h), extending over the whole of the outside of the tube, diffuse on lower lip; throat blotched.

96. Lore Fischer (Pfitzer).—Corolla $1\frac{1}{8}$ in. long, wider than long; throat compressed; rhodamine purple (67), extensive on tube, rather sharply defined on lower lip.

136. Louis Grandeau (Dobbie).—Corolla $1\frac{1}{8}$ in. long, wider than long; throat compressed; light amaranth purple (69 h), moderate on tube, diffuse on lower lip; throat blotched; tube lined.

49. Lucifer (Cutbush).—Corolla $1\frac{1}{4}$ in. long, equal to its diameter; throat open; light rose red (71 a), extending over the whole of the outside of the tube, diffuse on lip; lines pass but a short distance into the tube.

38. Magnificence (Cutbush).—Rather procumbent pedicels twisted; corolla $1\frac{1}{4}$ in. long and wide; throat open; rose red (71), extending over the whole of the outside of the tube, diffuse on lower lip; throat blotched; lines in tube.

57. Manoel (Lapworth).—Height 34 inches; corolla $1\frac{1}{4}$ in. long, wider than long; throat compressed; amaranth purple (69 i), slight on tube, diffuse on lower lip; throat heavily blotched, and slightly lined in tube. The stamens are deformed, and the staminode imperfect.

83. Margarete Bader (Pfizer), A.M. July 31, 1914.—Corolla $1\frac{1}{4}$ in. long, wider than long; throat compressed; rose (71 b), moderate on tube, sharply defined on lower lip, very heavy blotches in throat.

143. Marjorie (Hayward).—A variety of the 'Southgate Gem' type, and like that in form and habit, but the flowers are mallow purple (67 b), with no blotches or lines in the tube.

15. Mauve Queen (Cutbush).—Corolla $1\frac{1}{8}$ in. long and wide; throat compressed; phlox purple (65 b), slight on tube, rather sharply defined on lower lip, slight lines in the throat. This variety often produces monstrous flowers.

33. Mikado (Cutbush).—Habit rather poor; corolla $1\frac{1}{8}$ in. long, wider than long; amaranth purple (69 h), extending over the whole of the outside of the tube, diffusing on lower lip to light lines in the tube.

30. Miss Baird (Cutbush).—Corolla $1\frac{1}{4}$ in. long, wider than long; throat open; white, with a rose pink flush on the lips; lower lip somewhat deeply lobed.

59. M. Millardet (Barr).—Corolla $1\frac{1}{8}$ in. long, wider than long; throat open; amaranth purple (69 i), extending over the whole of the outside of the tube, blotched below, diffuse on the lower lip; throat heavily blotched; lined in tube.

118. Moorfoot (Dobbie).—Corolla $1\frac{1}{4}$ in. long, wider than long; throat little compressed; bright mallow purple (68 b), moderate on tube, sharply defined on lower lip; light lines inside the tube.

44. Mrs. A. C. Sweet (Cutbush), A.M. July 31, 1914.—Corolla $1\frac{1}{8}$ in. long and wide; throat compressed; deep Tyrian rose (69 h) extensive on the tube, very sharply defined on lower lip.

16. Mrs. Baird (Cutbush).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat open; rose red (71 a), extending over the whole of the outside of the tube, diffuse on lower lip, heavy blotches in throat and lines in tube; lower lip segments slightly toothed.

127. Mrs. Christie (Dobbie).—A large, heavy inflorescence; corolla $1\frac{1}{2}$ in. long, wider than long; throat open; rhodamine purple (67), slight on the tube, diffuse on lower lip; throat very heavily blotched; lines inside tube.

43. Mrs. E. Beckett (Cutbush).—This variety has larger and more shapely flowers, but in other respects is very like 'Hercules.'

69. Mrs. Forbes (Barr).—Corolla $1\frac{1}{2}$ in. long and wide; throat compressed; light amaranth purple (69 b), light on the tube, passing from the lower lip into very heavy blotches in throat; heavy lines inside tube.

77, 108. Mrs. Fred Fulford (Thompson, Dobbie), A.M. September 4, 1912.—Large, showy inflorescence, very free-flowering; corolla $1\frac{1}{2}$ in. long, and scarcely wider; throat open; rose red (71), extending over the whole of the outside of the tube, diffuse on lower lip; and a blotch; light lines inside tube.

146. Mrs. P. S. Hayward (Hayward), XXX July 31, 1914.—A variety of the habit and form of 'Southgate Gem,' with rosy scarlet flowers.

116. Mrs. Stewart Peter (Dobbie).—Corolla $1\frac{1}{2}$ in. long and wide; throat compressed; purple (65 h), extensive on tube, sharply defined on lower lip; slight lines inside tube.

74, 78, 110. Newbury Gem (Barr, Simpson, Dobbie).—Slender, spreading, 20 inches; corolla $1\frac{1}{2}$ in. long, much longer than wide; throat compressed; shows all stages between fully-developed staminode and a perfect stamen; carmine-scarlet (2 h), extending over the whole of the outside of the tube, passing on lower lip to heavy lines in the tube; lip segments pointed and slightly serrate. Dainty and very decorative.

117. Newbury Gem, white (Dobbie).—A white-flowered form of the preceding.

68. Nizza (Barr).—One plant only; similar to 'Southgate Gem.'

13. Oliver (Cutbush).—Height 32 inches; corolla $1\frac{1}{2}$ in. long, wider than long; throat open; mallow purple (67 a), extensive on tube, sharply defined on lower lip.

51. Othello (Cutbush).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat compressed; deep aster purple (67 i), extending over the whole of the outside of the tube, diffuse on lower lip.

61. Paul Pfitzer (Barr).—Corolla $1\frac{1}{2}$ in. long and wide; throat compressed; amaranth purple (6 a), extending over the whole of the outside of the tube, sharply defined on lower lip; lines inside tube; lower lip segments much exceed a semicircle.

139. Pentland (Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat compressed; bright rose (71 b), moderate on tube, passing on lower lip into a blotch in throat and light lines in tube; lip lobes serrate.

121. Perfection (Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat very open; mallow purple (67 b), moderate on tube, sharply defined on lower lip, slight blotching in throat.

6. Persimmon (Cutbush), **A.M.** July 31, 1914.—Height 22 inches. Corolla $1\frac{1}{2}$ in. long and wide; throat compressed; amaranth purple (69 i), very diffuse on lower lip; throat blotched, light lines inside tube; lower lip segments exceeding a semicircle.

28. Peter Pan (Cutbush).—Habit loose; corolla $1\frac{1}{2}$ in. long, equal to its diameter; throat open; purplish rose (68 b), slight on tube, diffuse on lower lip, which is somewhat deeply lobed.

85. Pfarrer Roemer (Pfitzer).—Corolla $1\frac{3}{4}$ in. long, wider than long; throat compressed; bright rose red (71), extensive on tube, diffuse on lower lip; faintly blotched in throat; lines inside tube. The outline of flower is undulate.

84. Pfarrer Weisser (Pfitzer).—This variety carries its almost regular flowers above the horizontal. Corolla $1\frac{3}{4}$ in. long and wide; throat open; phlox purple (65 b), white outside tube, slightly diffuse on lower lip, very heavy blotching in throat, lines inside tube; lip segments slightly lacinate.

67. Phryne (Barr), **A.M.** July 31, 1914.—The variety produces a great number of almost regular six-lobed flowers. Corolla $1\frac{3}{4}$ in. long and wide; throat open; bright rose red (71), extending over the whole of the outside of the tube, sharply defined on lower lip.

135. President Carnot (Dobbie), **A.M.** August 11, 1896.—A striking and distinct variety. Corolla $1\frac{1}{2}$ in. long, wider than long; throat compressed; pomegranate purple (71 h), extending over the whole of the outside of the tube; sharply defined on lower lip.

31, 98. Prima Donna (Cutbush, Gibbs).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat compressed; rose red (71), diffuse on lower lip; very lightly blotched in throat; tube outside white, very light lines inside.

47. Purple Emperor (Cutbush).—Of rather poor habit; corolla 2 inches long, wider than long; throat compressed; rosolane purple (69), extensive on tube, diffuse on lower lip; throat heavily blotched; heavy lines in the tube. The largest-flowered variety in the trial.

123. Purple Gem (Dobbie).—Except that the flower is rhodamine purple (67), this variety is identical with 'Bute' (No. 124).

106. René Vidart (Dobbie).—Corolla $1\frac{1}{2}$ in. long, wider than long; throat slightly compressed vertically; pansy purple (69 a), extending over the whole of the outside of the tube, diffuse on lower lip; throat slightly blotched, light lines inside tube.

100. Rosalba (Gibbs).—Corolla $1\frac{1}{2}$ in. long, longer than wide; throat vertically compressed, staminode imperfect; deep rose red (71), extending over the whole of the outside of the tube, sharply defined on lower lip.

54. Rosamund (Lapworth Co.), **A.M.** July 31, 1914.—Corolla $1\frac{1}{2}$ in. long, slightly wider than long; throat vertically compressed;

light rose red (71 a), extensive on tube, sharply defined on lower lip ; very heavy line in the tube.

41. Royal Scot (Cutbush).—Habit poor ; corolla $1\frac{7}{8}$ in. long, wider than long ; throat compressed ; light aster purple (67 i), extending over the whole of the outside of the tube, diffuse on lower lip ; throat slightly blotched ; lines in the tube.

12, 104. Rubicunda (Cutbush, Gibbs).—Tall, very free-flowering, inflorescence bushy. Corolla $1\frac{3}{4}$ in. long and wide ; throat rather small, compressed ; spectrum red (1 h), extending over the whole of the outside of the tube, diffuse on lower lip, light lines inside the tube ; lower lip segments exceeding a semicircle.

27. Ruby King (Cutbush).—Corolla $1\frac{7}{8}$ in. long, wider than long ; throat open ; light amaranth purple (69 i), extending over the whole of the outside of the tube, blotchy, diffuse on lower lip, heavily blotched in throat ; lines inside tube.

55. Scarlet Gem (Lapworth Co.).—Leaves narrow, deep green ; corolla $1\frac{3}{8}$ in. long, double its width ; throat vertically compressed ; deep spectrum red (1 a), extending over the whole of the outside of the tube, diffuse on lower lip, lightly blotched in throat ; heavy lines in the tube.

94. Schneefeld (Pfitzer).—Corolla $1\frac{5}{8}$ in. long, wider than long ; throat very open ; staminode imperfect ; a good, white flower, with a lacinate, undulate margin.

87. Schwester Magdalene (Pfitzer).—Corolla $1\frac{1}{2}$ inch long, wider than long ; throat open ; rose red (71) extensive on tube, sharply defined on lower lip.

90. Schwester Sophie (Pfitzer).—Corolla $1\frac{5}{8}$ in. long, wider than long ; throat open ; white.

142. Seagull (Hayward), **XXX** July 31, 1914.—The habit and form of 'Southgate Gem,' but the flower is white, and the lip segments slightly serrate.

48. Sirius (Cutbush).—Corolla $1\frac{3}{4}$ in. long and wide ; throat open ; amaranth purple (69), extending over the whole of the outside of the tube, diffuse on lower lip ; heavy blotching in the throat, lines in the tube.

140. Snowdrift (Hayward).—Rather more compact in habit, but otherwise like 'Seagull.'

63, 79, 126. Southgate Gem (Barr, Simpson, Dobbie), **A.M.** July 31, 1914.—Slender, many-stemmed, leaves narrow ; corolla $1\frac{3}{4}$ in. long, longer than wide ; throat vertically compressed ; carmine-scarlet (2 i), extending over the whole of the outside of the tube, diffuse on lower lip, heavy lines inside tube ; lip segments bluntly pointed. A profuse-flowering, highly decorative variety.

64, 109. Spitzburg (Barr, Dobbie).—Corolla $1\frac{7}{8}$ in. long, longer than wide ; throat open ; creamy white, flushed with rose pink.

58. Splendour (Lapworth Co.).—Corolla $1\frac{5}{8}$ in. long, wider than long ; throat open ; rose red (71), extending over the whole of the outside of the tube, sharply defined on lower lip ; light lines in the tube.

14. Sportsman (Cutbush), **A.M.** July 31, 1914.—Corolla $1\frac{1}{8}$ in. long, wider than long; throat open; staminode imperfect; rose red (71), slight on tube, diffuse on lower lip, light lines in tube; lower lip somewhat deeply lobed.

144. St. Katherine (Hayward).—Habit and form of 'Southgate Gem,' but mallow purple (67 b), extensive on the tube, diffuse on lower lip. This variety is almost indistinguishable from 'Marjorie.'

35. The Bride (Cutbush).—Corolla $1\frac{1}{8}$ in. long and wide; throat open; white, with a rosy margin and reverse to the lips; lower lip deeply lobed. In general characters very similar to 'Jane Dieulafoy.'

32. The Gift (Cutbush), **XXX** July 31, 1914.—Inflorescence large; corolla $1\frac{1}{8}$ in. long, wider than long; throat open; deep rose (71 a), extensive on tube, throat blotched with rose red (71); lines in tube.

8. Tom Short (Cutbush).—Height 24 inches; corolla $1\frac{1}{8}$ in. long, wider than long; throat open; amaranth purple (69 h), extending over the whole of the outside of the tube, rather sharply defined on lower lip, light lines in tube.

120. Tweed (Dobbie), **XXX** July 31, 1914.—Corolla $1\frac{1}{8}$ in. long and wide; throat compressed; mallow purple (68 b), moderate on the tube, rather sharply defined on lower lip; lines inside tube heavier near the mouth.

45. Virgil (Cutbush), **A.M.** July 31, 1914.—The flowers are held above the horizontal. Corolla $1\frac{1}{8}$ in. long, wider than long; throat open; staminode imperfect; light rose (71 a), extensive on tube, sharply defined on lower lip; throat faintly blotched.

9. Virgo Intacta (Cutbush).—Height 24 inches; corolla $1\frac{1}{8}$ in. long, wider than long; staminode imperfect; white, with a rose-pink flush around the margin of the lip.

141. Vulcan (Hayward).—The habit and form of 'Southgate Gem,' but rosy scarlet.

131. Waverley (Dobbie).—Corolla $1\frac{1}{8}$ in. long and wide; throat open; rose (71 b), slight on the tube, diffuse on lower lip, throat blotched, and light lines in the tube.

147. White Empress (Hayward).—This variety is identical with 'Marjorie' except that the colour is two shades deeper.

102. World's Desire (Gibbs).—Corolla $1\frac{1}{8}$ in. long and wide; throat open; spectrum red (1 h), extending over the whole of the outside of the tube, sharply defined on lower lip, throat lightly blotched, light lines in the tube.

BOOK REVIEWS.

"Coconut Cultivation." By H. L. Coghlan and J. W. Hinchley. 8vo., x + 128 pp.; illustrated. (Crosby Lockwood, London, 1914.) 3s. 6d.

Although this manual contains little that is new on the subject of coconut cultivation, it gives in a concise and convenient form much information that the intending planter will find useful. For the most part the information applies to conditions obtaining in the Malay Peninsula, and is intended for the use of both Chinese and European planters in that country. A chapter added after the main part of the manual had been prepared treats of the industry in the West Indies.

The descriptions of the machinery and plant employed on a modern coconut estate, and the estimates of the cost of planting and maintaining a plantation, are amongst the more valuable features of the book. There is, however, no reference to desiccated coconut, which is such an important product of the Ceylon coconut industry, and no particulars are given of the machinery and plant employed in its manufacture.

The book is furnished with a good index, and contains a number of illustrations of varying merit.

"The Cultivation of the Oil Palm." By F. M. Milligan, F.R.G.S. sm. 8vo., xii + 100 pp. (Crosby Lockwood, London, 1914.) 2s. 6d. net.

The African oil palm (*Elaeis guineensis*) is the source of the principal articles of export from the West Coast of Africa, namely palm oil and palm kernels, both of which are obtained from the fruit of the palm. It also yields a number of products of economic importance to the natives. Palm oil is in great and increasing demand by soap manufacturers in this country. Hitherto the supply has been chiefly obtained from wild palms by native methods, but in order to maintain the supply the cultivation of the oil palm will eventually have to be undertaken, and modern methods of preparing the oil employed.

A well-written and informative manual on the cultivation of the oil palm would be much appreciated at the moment, as the subject is receiving the attention of planters, and the available information, although fairly extensive, is somewhat scattered. This manual does not fulfil this want; it is written in such a poor and discursive style that the little information it does contain is difficult to come by; moreover, some of the information, such, for instance, as the descriptions of the male and female flowers (pp. 24-30), is inaccurate.

"Pot-pourri Mixed by Two." By Mrs. C. W. Earle and Miss Ethel Case. 8vo., 456 pp. (Smith, Elder, London, 1914.) 7s. 6d. net.

Everyone has read Mrs. Earle's book "Pot-pourri from a Surrey Garden" and everyone will eagerly read this. The collaboration of the two authoresses has resulted in a really delightful book containing new recipes not found in Mrs. Earle's book mentioned, and a charming mixture of practical information on gardening matters, poetry, travel, medicine, history, and a whole host of things that make the book thoroughly interesting from cover to cover. It is well printed, well indexed, and a book worthy a place in any library.

"More Gardening Don'ts." By Marion Chappell. 8vo., 55 pp. (Bickers, London, 1913.) 2s. net.

A pocket-sized little volume, nicely printed and illustrated, full of useful don'ts. There is no index.

"Colour Schemes for the Flower Garden." By Gertrude Jekyll. 8vo., 159 pp. Ed. 3. (Country Life, London, 1914.) 12s. 6d. net.

We have reviewed the previous editions of this exceedingly interesting and instructive work, and we need only say, if you have not already got it, get it without delay.

"Wall and Water Gardens." By Gertrude Jekyll. 8vo., 214 pp. (Country Life, London, 1913.) 12s. 6d. net.

The fact that this excellent book has run into its fifth edition indicates its value much more than anything we can say, and comment is needless.

"Gardens in the Making." By Walter H. Godfrey. 8vo., 207 pp. (Batsford, London, 1914.) 5s. net.

This book is admirably printed and freely illustrated, and contains a great deal of valuable information and instruction on the formation of gardens, particularly those of a more or less formal character. In our opinion the book would be greatly improved by a few chapters on wild gardening and the less formal kinds of garden-making. A good index completes the book.

"Spade Craft." By Harry A. Day, F.R.H.S. 8vo., 137 pp. (Methuen, London, 1914.) 1s. net.

Taken altogether, this is a very serviceable book for the amateur, giving a great deal of useful advice, but we think the author is inclined to exaggerate on the question of lime. While fully endorsing his opinion of lime for the land, and agreeing that lime is not employed so much as it ought to be, we do not agree with lime and manure being put on together, unless dug in immediately, otherwise the value of the manure is reduced enormously. Again, on page 18 he states that "he doubts whether it is possible for any well-cropped land to be over-limed." Surely this is wrong. Again, on page 19 the author

says, "Gas-lime kills *everything*, and the ground it is applied to cannot be used for cropping for quite six months." We have used gas-lime in quantity, and have not found it so efficacious in destroying insect and fungoid pests, or weeds, but of course the gas-lime of to-day is usually far less efficacious than that of older times. A capital index finishes the book.

"The Perpetual Flowering Carnation." By E. J. Wootten. 8vo., 55 pp. (Simpkin, London, 1914.) 3s. net.

So much interest is taken in the perpetual flowering carnations that they are now cultivated in almost every garden of any extent, and are looked upon as almost indispensable; and although this book of Mr. Wootten's is rather expensive for its size, we have no hesitation in saying it is well worth its cost. The treatment of the plants from the seedling or cutting stage, both indoors and outdoors, is ably dealt with; soils, calendar of operations, stopping and cutting back, insect and fungoid pests, and, last but not least, watering, are all clearly described. We commend the author's advice on watering to all amateurs and young gardeners, viz. "On no account over-water your plant; never give it more than it can absorb or drink up. Do not water on Saturday to save watering on Sunday. If your plant does not want it, do not give it any." There are probably more failures with Carnations through careless or injudicious watering than from any other cause.

The book closes with a general index of the best varieties.

"The Carnation Year Book." By J. S. Brunton. 8vo., 80 pp. (Hortus Printing Co., Burnley, 1914.) 1s. 6d., post free.

This is the official publication of the Perpetual Flowering Carnation Society, and in the contents are the list of officers, members, rules, varieties registered, and a number of instructive articles by some of the leading experts in Carnation culture. There is no index, but it is scarcely necessary in such a book.

"A Woman's Hardy Garden." By Helena Rutherford Ely. With illustrations from photographs taken from the author's garden by Prof. C. F. Chandler. 8vo., 216 pp. (Macmillan, London and New York, 1903.) 7s. 6d. net.

A chatty, cheerful little American book of gardening instructions, beautifully and profusely illustrated. There are chapters on seed-beds, perennials, annuals, roses, &c., and some amusing remarks about professional gardeners of the jobbing type. One of these was a German, who took no interest in flowers, but half-filled the garden with "kohl-rabi" and "korn salad," and considered "one kind of flower was enough to raise anyway."

At the end of the book are the following words, which are as true of English women as American:—

"If the rich and fashionable women of this country took more

interest and spent more time in their gardens, and less in frivolity, fewer would suffer from nervous prostration and the necessity for the multitude of sanatoriums would be avoided. Flower gardening is pre-eminently a woman's occupation and diversion."

"Our Mountain Garden." By Mrs. Theodore Thomas (Rose Fay). 8vo., 212 pp. (Macmillan, London and New York, 1904.) 6s. 6d. net.

The mountain garden here described must have been a very fascinating and beautiful spot when complete and fully matured. The natural scenery of woodland and rocky boulders was utilized in the formation of a "cultivated" wild garden. The effect of *Lobelia cardinalis* and tiger lilies in a dark swamp locality overhung with trees would be very fine, while broad plantings of Lupines, Columbines, Anemones, Trilliums, and Oxalis, in woody knolls and hollows, with harebells, edelweiss, Dicentra, and soapwort on open ledges gave fine masses of colour when in bloom.

It was certainly a pity the authoress did not study gardening a bit before launching out on so large a scale, and the failures she had at first, due to ignorance in all horticultural matters, must have made her hard work very disheartening.

Instead of starting her garden with good plants from a trustworthy nursery firm, she used seeds, and, as she states in the beginning of the book, "fifty little inch-high seedlings did not go far towards filling a bed 100 feet long and 10 to 16 feet wide." But she wrestled heroically with the disappointments that accrue from sowing seeds in sun-baked uncultivated clay, and made the common mistake of digging into it vast quantities of sand (as some of our English enthusiasts do the "road grit" of the Borough Councils, well lubricated with petrol, tar, and dust-laying chemicals-), only to find that more plants died than lived. But at last all difficulties were overcome, with wonderfully good results crowning her perseverance.

The book is profusely illustrated from photographs, and makes interesting reading.

"My Garden in Summer." By E. A. Bowles, M.A. 8vo., viii + 316 pp. (Jack, London, 1914.) 5s. net.

The reader of the companion volume, "My Garden in Spring," will eagerly accompany the author through his summer garden. His journey, as earlier in the year, will be enlivened by anecdotes, some of the plants themselves, others of incidents only remotely connected with the plants yet suggested to the author by the plants he shows, and he will be rewarded by many a hint, always modestly, never didactically given. Irises, Roses, Geraniums, aquatics and succulents, and a whole host of smaller or less conspicuous plants come in for notice. The black-and-white illustrations are admirable, and there are also several coloured ones.

"The Country Month by Month." By J. A. Owen and G. S. Boulger. 8vo., x + 492 pp. (Duckworth, London, 1914.) 6s. net.

This calendar of the changing face of the country and its wild life, birds and beasts and insects, flowers and trees, was first published in 1901. The present edition has been revised, and numerous notes by Lord Lilford on bird-life enrich it. It is a book of much literary charm, and will be welcomed by the nature-lover.

"Makers of Modern Agriculture." By W. Macdonald, D.Sc. 8vo., ix + 82 pp. (Macmillan, London, 1913.) 2s. 6d. net.

The lives of the men to whom modern agriculture owes its remarkable progress, Jethro Tull, Thomas Coke of Holkham, Arthur Young, John Sinclair, and Cyrus H. McCormick, are passed in brief review and their teaching is outlined in few words, but without omitting any essential. The book is worthy of perusal by all who would know the authors of the main steps of progress in agriculture, four of them Britons, one McCormick the inventor of the reaping machine, an American, a descendant of Scots who, after settling in Ulster, emigrated to Virginia.

"The Horticultural Note-book." By J. C. Newsham. 8vo., xx + 418 pp. (Lockwood, London, 1914.) 4s. 6d. net.

A tremendous amount of useful information is brought together in this little book on all sorts of questions that arise in connexion with almost every phase of gardening. Weights and measures, which vary so much in different parts of the country and for different things, land measuring and mensuration, garden formation, horticultural buildings, hedges, fences and gates, soils, manures, the propagation of plants and seed sowing, fruit, flower, and vegetable cultivation, trees and shrubs for various purposes, insecticides and fungicides, garden meteorology, and garden recipes each have their chapter, and several illustrations help to elucidate the text. A full index is given. It is evident the author has spent great pains in compiling this useful reference book, and though, no doubt, continued use would find it wanting here and there, and though there are a few misprints scattered through its pages, it is so full and so accurate that we can recommend all who have to deal with gardens of any size to its pages with the assurance that they will not fail to obtain much help therein.

"Cattleyen und Laelien." By A. Hefka. 8vo., vii + 83 pp. (Frick, Vienna, 1914.) K4.80.

A general account of the cultivation of Laelias and Cattleyas and of some of their hybrids is followed by descriptions of many of the species. Propagation is described, and finally the question as to whether orchid-growing for market is a profitable proceeding is discussed. Those orchid-growers whose knowledge of German permits them to read this book will find a good deal to interest them and possibly some suggestive hints.

"Standard Cyclopedia of Horticulture." Ed. by L. H. Bailey. 1a. 8vo. vol. i. A-B, xx + 602 pp.; vol. ii. C-E, 603-1200 pp. (Macmillan, New York, 1914.) 25s. each net.

Fourteen years ago the editor of the present encyclopædia compiled the "Cyclopedia of American Horticulture." That work was comprised in four volumes, and represented the state of North American horticulture at the close of the nineteenth century. It found many on this side of the Atlantic to appreciate its excellencies, and this new work will likewise be warmly welcomed.

The number of plants to be included is considerably greater than in the earlier work, owing to a larger area covered (for the present work is not wholly American in intention), to the continuing growth of horticulture in America, especially perhaps in appreciation of the value of trees and shrubs, and to other causes which have operated on perhaps a smaller scale. So greatly has the number increased, however, that six volumes, each as large as these, will be required to contain them.

After a number of miscellaneous paragraphs, a synopsis of the plant kingdom, written by K. M. Wiegand, and extending to 78 pages of notes on the families of plants, and a key to the families and genera occupying a further 79 pages, precede the systematic treatment of the various genera &c. For some not very obvious reason, the sequence in the synopsis of families is quite different from that in the key. Lists of meanings of specific names and a glossary of botanic terms also fulfil a very useful purpose.

The systematic treatment of subjects is arranged alphabetically, the first treated of being Abaca or Manila hemp, the next *Abelia*, and so on (a useful feature is the indication of the pronunciation of plant names). The treatment of *Abelia* will illustrate the general plan of the work. The derivation of the name of the genus is given, the family to which it belongs, and a general note on the use of the species; then follows a description of the genus, a paragraph on its hardiness, another on cultivation, and another on propagation. A key enables one to "run down" quite readily, by means of reference to obvious characters, the various species in cultivation, and a note refers to Rehder's synopsis of the genus in Sargent's "Plantae Wilsonianae," i. pp. 122-129. Full descriptions are then given of the cultivated species, *Graebneriana*, *Engleriana*, *grandiflora*, *chinensis*, *triflora*, and *floribunda*. A note on the flowering period, country of origin, references to reliable figures, synonyms, and cultural value follow. Briefer descriptions and notes on less known species bring the account of the genus to a close. Each of the genera in American cultivation is treated in this comprehensive fashion, and the information is made more readily available by the excellent keys to each of the genera dealt with. Numerous figures and many plates (some of them coloured) greatly increase the value of the work, though unfortunately many of the blocks from which the figures are printed are much worn.

When such an important subject as the cultivation of the apple is concerned several authorities have been laid under contribution, each of them to deal especially with its characteristics in their own district, so that a comprehensive and accurate purview of the whole matter is obtained. Fruits and vegetables are all well dealt with.

The book will prove an invaluable addition to any garden library, and a source of reliable information on almost every plant cultivated. The accuracy of spelling of plant names and the like is remarkable all through, while an admirable choice of type renders the consultation of the book easy. Only one thing, perhaps, calls for a little criticism—the alleged derivation of some of the generic names.

“Civic Art: Studies in Town-Planning, Parks, Boulevards, and Open Spaces.” By Thomas Mawson, M.R.I.B.A. 4to. 376 pp. (Batsford, London, 1911.)

The author of this well got-up, instructive, amply illustrated book is well known as a landscape gardener of proved ability, and well known too as an authority on town-planning. Town-planning has for its aim the betterment of the material conditions of those who have to live in great industrial centres. Its experts have to consider not only the planning of wide and airy thoroughfares, arranged in every way so as to provide ready access to all parts of the district, and so as to connect all the principal communal buildings, open spaces, and the like, and to provide conveniences of all kinds to beautify and facilitate the use of these thoroughfares, but they have to design convenient, hygienic, and beautiful houses of all kinds to suit the pockets of all classes of the community. Their task is not an easy one, and while it is perhaps fairly easy to lay down general directions which such work should follow, difficulties of all kinds arise so soon as the principles have to be applied to any particular case.

The author states in clear terms the principles as he sees them, and goes on to demonstrate by numerous examples the fashion in which they may be applied to particular cases. In no two places are the conditions alike, local topographical conditions vary, the populations to be catered for in different localities have different requirements and different aspirations, and Mr. Mawson does not shirk the responsibilities self-imposed when he undertook the task of writing this book, for his examples have been chosen from the most varied types of site and situation available. He shows himself to be a master of all the factors which go to the making of a competent exponent of civic design in principle and in practice, on the legal, social, and economic sides as on the scientific and technical.

No detail is omitted: street lamps, garden fencing, tramway shelters, and so on are alluded to and figured. The value of greensward and trees is illustrated. Bridges, statuary, promenades, municipal buildings, grand avenues, cathedrals and cottage homes, the arrangement of parks, all come in for their share of attention.

Justice cannot be done to the many excellencies of the work Mr. Mawson has produced, and we can only commend it to the serious student of civic planning, and to all those to whom the care of towns and villages is entrusted, whether as members of city or town councils or as landowners.

The numerous illustrations, which form a conspicuous feature of the book, reflect great credit upon designer and publisher alike.

"The School Garden Monthly." Ed. by D. Houston. 8vo. 12 pp. (D'Olier St., Dublin.) 1d. monthly.

School gardening has proved a valuable educational influence in many English and Scottish schools of late years, and is now making steady progress in Irish elementary and secondary schools. We feel sure teachers will welcome this new monthly publication, which is eminently suitable to put into their pupils' hands as a reading book. We are glad to see that the spirit of the older naturalists actuates the editor, for too much organization, too much making easy of the path, soon kill the educative value of nature-study and school-gardening, and of every other human activity, for human beings if they are to progress must not be made into machines.

"Manual of Fruit Insects." By M. V. Slingerland and C. R. Crosby. 8vo. xvi + 503 pp. (Macmillan Co., New York, 1914.) 8s. 6d. net.

The "Rural Manuals" have established a just claim for recognition among books dealing with gardening and farming, and the latest addition will only add to the reputation the series has gained. It deals, of course, with American fruit pests and includes those that attack apple, pear, quince, plum, peach, cherry, raspberry, blackberry, dewberry, currant, gooseberry, strawberry, grape, and cranberry.

Many of the insects dealt with are fortunately not troublesome in this country, and of those common to both, the life-histories are not always the same, but the complete account of methods of prevention and remedy will prove very suggestive to those who have to fight similar pests in this country.

No fewer than one hundred and three insects are deemed worthy of notice as pests of the apple, while Theobald in his "Insect Pests of Fruit," the fullest account of fruit enemies we have in England, mentions only sixty-two. The pests of other fruits are similarly fully dealt with. The apple *Psylla* does not appear to occur in America, nor does the apple saw-fly. These are two of our worst pests, and we can only hope, for the sake of our American cousins, that it may be long before they invade their orchards as the American gooseberry mildew has ours.

The get-up of the book leaves nothing to be desired.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* renders subsequent reference to the original easy. The order agreed on is as follows:—

1. To place first the name of the plant, disease, pest, &c., being noticed; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 453, 454.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
IN THIS WORK.

Baker, F. J., A.R.C.S., F.R.H.S.
 Ballard, E., F.R.H.S.
 Bowles, E. A., M.A., F.L.S., F.E.S., F.R.H.S.
 Brennan, A., B.Sc., F.R.H.S.
 Bunyard, E. A., F.R.H.S.
 Cavers, Prof. F., D.Sc., F.R.H.S.
 Cayley, D. M., F.R.H.S.
 Chittenden, F. J., F.L.S., F.R.H.S.
 Clayton, C. P., F.R.H.S.
 Cooke, M. C., M.A., LL.D., A.L.S., F.R.H.S., V.M.H.
 Cotton, A. D., F.L.S.
 Darlington, H. R., F.R.H.S.
 Druery, C. T., V.M.H., F.L.S., F.R.H.S.
 Dykes, W. R., M.A., F.R.H.S.
 Farmer, Professor J. B., M.A., D.Sc., F.R.S., F.R.H.S.
 Groom, Professor Percy, M.A., D.Sc., F.L.S., F.R.H.S.
 Henslow, Rev. Professor Geo., M.A., F.L.S., F.R.H.S., V.M.H.
 Hodgson, M. L., F.R.H.S.
 Hooper, Cecil H., M.R.A.C., F.R.H.S.
 Horne, A. S., B.Sc., F.G.S., F.L.S., F.R.H.S.
 Houston, D., F.L.S., F.R.H.S.
 Jeffery, Violet G., F.R.H.S.
 Kerridge, Rev. A. A., M.A., F.R.H.S.
 Long, C. H., F.R.H.S.
 Massee, Geo., F.L.S., F.R.H.S., V.M.H.
 Newstead, Professor R., A.L.S., F.E.S., F.R.S., F.R.H.S.
 Pethybridge, G. H., B.Sc., Ph.D., F.R.H.S.
 Petts, Alger, F.R.H.S.
 Rendle, A. B., M.A., D.Sc., F.L.S., F.R.S., F.R.H.S.
 Reuthe, G., F.R.H.S.
 Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
 Simmonds, A., F.R.H.S.
 Smith, William G., B.Sc., Ph.D., F.R.H.S.
 Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
 Voss, W. A., F.C.S., F.R.H.S.
 Webster, A. D., F.R.H.S.
 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales . . .	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope . . .	Agr. Jour. Cape G.H.
Annales Agronomiques . . .	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault . . .	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort. . .	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles . . .	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg . . .	Ann. Jard. Bot. Buit.
Annals of Botany . . .	Ann. Bot.
Beihft zum Botanischen Centralblatt . . .	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura . . .	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana . . .	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticultura . . .	Boll. R. Soc. Tosc. Ort.
Botanical Gazette . . .	Bot. Gaz.
Botanical Magazine . . .	Bot. Mag.
Bulletin de la Société Botanique de France . . .	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret . . .	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France . . .	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane . . .	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne . . .	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica . . .	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad . . .	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations . . .	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie . . .	Cent. f. Bact.
Chronique Orchidéenne . . .	Chron. Orch.
Comptes Rendus . . .	Comp. Rend.
Contributions from U.S.A. Herbarium . . .	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria . . .	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand . . .	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées . . .	Dict. Icon. Orch.
Die Gartenwelt . . .	Die Gart.
Engler's Botanische Jahrbücher . . .	Eng. Bot. Jah.
Gardeners' Chronicle . . .	Gard. Chron.
Gardeners' Magazine . . .	Gard. Mag.
Gartenflora . . .	Gartenflora.
Journal de la Société Nationale d'Horticulture de France . . .	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture Victoria . . .	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies . . .	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research . . .	Jour. Agr. Research.
Journal of Agricultural Science . . .	Jour. Agr. Sci.
Journal of Botany . . .	Jour. Bot.
Journal of Chemical Society . . .	Jour. Chem. Soc.
Journal of Economic Biology . . .	Jour. Econ. Biol.
Journal of Economic Entomology . . .	Jour. Econ. Entom.
Journal of Genetics . . .	Jour. Gen.
Journal of Horticulture . . .	Jour. Hort.
Journal of the Board of Agriculture . . .	Jour. Bd. Agr.
Journal of the Linnean Society . . .	Jour. Linn. Soc.
Journal of the Royal Agricultural Society . . .	Jour. R.A.S.
Journal of the Society of Chemical Industry . . .	Jour. Soc. Chem. Ind.
Journal S.E. Agricultural College, Wye . . .	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte . . .	Kais. Ges.
La Pomologie Française . . .	Pom. Franç.
Le Jardin . . .	Le Jard.

Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society .	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden . . .	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc. .	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc. .	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc. .	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins . .	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications . .	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abies magnifica (*Bot. Mag.* tab. 8552).—N.-W. United States. *Nat. Ord.* Coniferae, *Tribe* Abietineae. Tree 250 feet high. Crown round-topped, trunk 10 feet thick, almost devoid of branches to the middle, bark long remaining a silvery white. Leaves $\frac{3}{4}$ –1 $\frac{1}{2}$ inch long, persisting for ten seasons. Female cones (ripe) oblong-cylindric, 6–9 inches long, 2 $\frac{1}{2}$ –3 $\frac{1}{8}$ inches wide, tawny-purple to blackish.—*G. H.*

Acacia \times 'H. C. White.' By W. T. (*Gard. Chron.* April 18, 1914, p. 262; 4 figs.).—Agreement with the assumption that the parents are *A. dealbata* and *A. Baileyana*.—*E. A. B.*

Actinidia chinensis (*Bot. Mag.* tab. 8538).—China. *Nat. Ord.* Ternstroemiaceae, *Tribe* Sauraujeae. Shrub, climbing. Leaves, dimorphic, on sterile twigs elliptic, on floral twigs suborbicular, 2 $\frac{1}{4}$ –5 inches long. Flowers 1-sexual, orange-yellow, 2 inches across. Stamens very many.—*G. H.*

Agricultural Schools, The Danish People's High Schools and (*Jour. Bd. Agr.* vol. xxi. No. 3, pp. 227–234).—The nature and scope of these institutions are described.—*A. S.*

Air, Castor-oil Plant, and Laboratory. By E. M. Harvey (*Bot. Gaz.* Nov. 1913, pp. 439–442).—*Ricinus communis* was found to be quite extraordinarily sensitive to impurities in the atmosphere. A very small amount, .0001 per cent., of ethylene produced a definite response, and one part in a million produced drooping of petioles or folding down of laminas. It is probably ethylene which produces similar results in sweet pea seedlings.

The castor-oil plant should prove extremely useful as a detective of ethylene in laboratories and greenhouses.—*G. F. S. E.*

Aleyrodidae, Classification of. By A. L. Quaintance and A. C. Baker (*U.S.A. Dep. Agr., Bur. Entom., Tech. Ser.* 27, pt. i. March 1913; 34 pls.).—This paper deals with certain features of the anatomy and external structure of the Aleyrodidae, and shows the position of the family among homopterous insects.

All species of the family at present known are treated, save those belonging to *Aleyrodes*, and this genus will be made the subject of a later publication.—*V. G. J.*

Alfalfa, Arabian. By R. McKee (*U.S.A. Dep. Agr., Bull.* 119, pp. 25-30).—Arabian alfalfa has large pale leaflets, soft, hollow stems and soft crowns and roots, and is hairy. It can only be grown in a very mild climate. Its life period is three years. It is severely damaged by close pasturing or heavy trampling, and cannot be recommended.—S. E. W.

Ampelopsis megalophylla (*Bot. Mag.* tab. 8537).—China. *Nat. Ord.* Ampelidaceae. Climbing shrub. Leaves compound, 2-3 pinnate. Leaflets 5 inches long. Flowers green, very small. Fruit, red-purple to blackish, $\frac{1}{2}$ inch across.—G. H.

Anthers, The Mechanism of Opening. By M. Schips (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 2, pp. 119-208, Dec. 1913; with 6 figs.).—This article is almost a monograph of all that has been written on this subject, and contains numerous original measurements of cells and cell-thicknesses both in the open and in the closed conditions. The author concludes that it is unnecessary to bring in the idea of cohesion, for the contraction theory is sufficient. The contraction (shortening) of isolated cells and the air contents of the anthers during the various stages of opening show that this is so. True cohesion folds do not occur. Neither the vacuum method of Steinbrinck nor artificial opening of the anthers by means of water-absorbing substances as practised by Hannig proves a cohesion mechanism.

During the process of drying, the fibres or fibrous cells contract as follows: In cross-section the contraction is 15 per cent. parallel to and 25 per cent. at right angles to the unthickened part of the cell; longitudinally (along the chord—"Sehne") 10 per cent. The unthickened membrane contracts 45 per cent. at right angles to the fibres, and therefore is chiefly responsible for the opening; the fibres act especially as resistants against the locular wall. The adaptations in cell structure and in the arrangement of the anthers to the method of opening are clearly brought out. With the same breadth, the higher the cell, the stronger the contraction.

Unfortunately there is not space to give details of the author's measurements of injured and uninjured cells, &c., which must have required an extraordinary amount of labour. There is an excellent bibliography.—G. F. S. E.

Apple and Cherry Ermine Moths, The. By P. J. Parrott and W. J. Schoene (*U.S.A. Exp. Stn., New York, Tech. Bull.* 24, Nov. 1912; 9 pls., 8 figs., 1 map).—These insects were introduced on imported nursery stock: *Yponomeuta malinellus* Fcbl., which lives on the apple, and *Y. padellus* L., which is a more general feeder, showing preference for hawthorn, plum, and cherry. Both species are common and destructive fruit pests in Europe.—V. G. J.

Apple, Brown Rot Canker in. By E. S. Salmon (*Gard. Chron.* Aug. 1, 1914, p. 85; 3 figs.).—Further investigations of

Monilia fructigena. Apples decaying from its effects often hang on trees, and if in contact with a branch the fungus passes in and forms a canker. The mycelium also passes into the wood from fruit spurs infected from flowers or fruit. Attacks should be met by removal of all dead wood and cankers, followed by spraying with Bordeaux mixture, and flower spurs attacked in spring should be cut off.

E. A. B.

Apple 'Deacon Jones.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364, 1913).—An apple of recent origin, recommended for market purposes.—E. A. Bd.

Apple 'Delicious.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—This fruit is perhaps the best advertised of American types, and is recommended for home use and possibly for market culture. As far as present trials have gone, it seems likely to do well also in this country.—E. A. Bd.

Apple Leaf-spot Fungi, Experiments with. By J. W. Roberts (*Jour. Agr. Research*, ii. pp. 57-66, April 1914; figs.).—The experiments described indicate that *Alternaria mali*, sp. n., is capable of causing enlargement of dead spots on apple foliage, and is a rather strong facultative parasite. *Coniothyrium pirinum* has little power in this direction, while *Coryneum foliicolum*, *Phyllosticta limitata*, *Monochaetia mali*, and *Phomopsis mali* are (on apple leaves) purely saprophytic.—F. J. C.

Apple Maggot, A Study of the Biology of the, together with an Investigation of Methods of Control. By James F. Illingworth (*U.S.A. Exp. Stn., Cornell, Dep. Entom., Bull.* 324, Dec. 1912; 29 figs. and bibliography).—The apple maggot is the larva of a fly (*Rhagoletis pomonella*) which destroys apples by tunnelling the fruit, causing it to become brown and rotten. The eggs are laid in punctures made in the skin, and hatch in from two to six days, according to the temperature. The larvæ feed on the pulp for two weeks to two months or more. The pupa stage is usually spent in the ground, just below the surface, and sometimes within decayed fruit. It may last for only a month for the early-emerging larvæ, but continues all the winter in late varieties.

The methods of control consist of picking up windfalls and spraying with arseniate of lead when the flies emerge, repeating every ten days while the flies are about.—V. G. J.

Apple 'Opalescent.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—An apple of recent origin, which has become rapidly known in the United States. In use until January Remarkable for its brilliant colour.—E. A. Bd.

Apple Orchard, Fungicides in the. By Charles Brook (*U.S.A. Exp. Stn., New Hamp., Bull.* 161, July 1912).—A number of experiments with various fungicides are discussed. Bordeaux mixture gave best results, followed closely by lime-sulphur, the latter proving especially effective against scab.

Lead arseniate was found to be the only satisfactory insecticide to add to above fungicides.—*C. P. C.*

Apple Packing in Boxes. By E. Meeking (*Jour. Dep. Agr. Victoria*, Nov. 1913, p. 702).—When the case has been properly packed, the top should show a bulge of about $1\frac{1}{2}$ inch. The top is fastened by nailing a cleat at one end and then pressing the top to the other end of the case, where it is fastened by another cleat. The pressure thus brought upon the fruit should reduce the bulge on top by one-half, and, of course, cause a bulge of corresponding dimensions on the bottom of the case. The bulge in a properly packed case should thus be about $\frac{3}{4}$ of an inch both top and bottom.—*C. H. H.*

Apple Picking : from "Hints on Packing and Forwarding Fruit for Export." By J. G. Turner (*Jour. Dep. Agr., Victoria*, March 1914, p. 155).—In general, it may be stated that the fruit is fit to pick when the pips have changed from their original light tint to a brown tint, but this, in itself, is not always sufficient. The fruit should be well developed, but not fully ripe. Some amount of colour should be developed in red varieties of apples. Undersized fruits should be left on the tree for home requirements, or may be left to develop for later pickings. Fruit should not be picked unless dry. Gather it in the early part of the day, before it becomes warm by the heat of the sun. Avoid all bruising; use a light pointed ladder shaped something like an elongated A. Do not shake or drag the fruit from the trees. Cut or break each fruit off at the spur. The picked fruit should be placed in a bag worn in the same manner as an apron, and made so that it may be opened at the bottom, thus allowing the fruit to run out into the boxes with a minimum of bruises. Before packing, the fruit should be cooled off, by being run into the shade of a fruit-shed or store-room, where it will get a chance to lower its temperature; this will also assist in drying any moisture, and will toughen the skin and add to the chances of successful carriage.

C. H. H.

Apple, The 'Rough-Bark' Disease of Yellow Newtown. By John W. Roberts (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 280; 1913).—The writer has given the name of *Phomopsis mali* to the fungus which causes this disease, and describes it as a new species very similar to, but differing from, *Phoma mali*.

The Yellow Newtown apple is the only variety of apple known by the author to be susceptible to the disease. The smaller branches can be girdled and killed outright, but the larger limbs and trunk are only injured locally and badly roughened.

The spores are enclosed in pycnidia, which are often plurilocular. The fungus can cause rot in the apple under artificial conditions, but it seldom occurs in nature. As preventives the author can only suggest the careful pruning away of all diseased parts, and general healthy cultural conditions. Sprays have proved ineffective.

D. M. C.

Apple, Water Core. By P. J. O'Gara (*Phytopathology*, iii. p. 121, Apr. 1913; figs.).—This trouble is characterized by hard watery areas extending outward from the outer edges of the seed cavities. These areas are at first connected with vascular bundles, and they may appear anywhere in the fruit. Later the seed cavities usually contain liquid, and the leathery part of the core is cracked and covered with hair-like growths, which finally become brown. The author considers excessive or strong vegetative growth, high cultivation, excessive rainfall or irrigation shortly before the maturity of the fruit, especially when followed by extremes of temperature and atmospheric humidity, severe pruning or other cause of serious defoliation, frosts, and the rapid conversion of starch into sugar, are the causes leading to water core. Under proper storage conditions water-cored fruit will entirely recover.

F. J. C.

Apple, Winter Spraying with Solutions of Nitrate of Soda. By W. S. Ballard and W. H. Volck (*Jour. Agr. Research*, i. pp. 437-444, Feb. 1914; figs.).—It is reported that winter spraying with nitrate of soda 50 lb., caustic potash 7 lb., and water 50 gallons has a marked effect on hastening flowering, as well as stimulating self-sterile varieties to fruit, and in promoting the vigour of the apple and pear trees sprayed in winter with the solution. As the authors point out, no very exact controls were arranged, but they regard the results as indicative of marked benefit if spraying is adopted.—F. J. C.

Apples, Scab Disease of. By E. Wallace (*U.S.A. Exp. Stn., Cornell, Bull.* 335, September 1913, pp. 545-624; 11 plates, 5 figs.).—This paper gives an exhaustive account of the life-history of the disease, caused by the fungus *Venturia inaequalis*, and gives some important measures for the control of this disease. These may be detailed as follows: I. Spraying with liquid Bordeaux mixture or lime-sulphur solution. II. Spraying with dust Bordeaux (*i.e.* Bordeaux mixture powdered and used as a dry dust). This method, however, under ordinary conditions, is not so satisfactory as the liquid Bordeaux. III. Selection of resistant varieties. "This, however, offers little promise of control. No variety is likely to remain immune for many years."

This is followed by instructions when to spray, and concludes with a fairly complete bibliography.—A. B.

Apples, Variation in. By F. K. Shaw (*Agr. Exp. Stn., Mass., Bull.* 149, 1914).—A careful record was kept of the number and size of fruits of certain apples from 1908 to 1913, with a comparison of the fruits from the different parts of the tree. The most interesting points elicited are the fact that the average size of the fruit is only adversely affected when an unusually large crop is borne. A moderately large crop has no effect upon the average size. A relationship is found to exist between the form of the apple, if more or less elongated or flat, and the temperature for a short period following the bloom. The cooler this period, the more elongated will the fruit be. The most important dates in this respect are the sixth to the sixteenth days following full bloom.—*E. A. Bd.*

Arbor Vitae, The Chinese. By C. A. Scott (*U.S.A. Exp. Stn., Kansas, Dep. For., Circ.* 33).—This tree, which has recently been introduced to the United States, makes a capital wind screen and produces a fair quantity of valuable timber. In general appearance the tree resembles the better known American arbor vitae, but from a timber point of view is perhaps to be preferred. Both species do well in this country.—*A. D. W.*

Aristolochia gigantea (*Bot. Mag.* tab. 8542).—Brazil. *Nat. Ord.* Aristolochiaceae. Shrub, twining, woody. Leaves, wide, ovate-cordate, 3-4 inches long, $1\frac{1}{2}$ - $3\frac{1}{2}$ inch broad. Flowers solitary. Perianth inflated at the base, $2\frac{1}{2}$ inches long, green tinged with violet, middle portion constricted; throat yellowish within, velvety; limb elliptic, 9 inches long, $6-6\frac{1}{2}$ inches wide, purplish brown, with pale yellow reticulations.—*G. H.*

Arseniate of Lead as an Insecticide against the Tobacco Hornworms. By A. C. Morgan, and J. C. Parman (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 173, May 1913; 3 tables).—Arseniate of lead used dry, from $3\frac{1}{2}$ to 5 lb. per acre, mixed with dry ashes in equal bulk, applied with a "dust gun" having a fan diameter of 8 inches, is a safe and effective application, since it does not cause injury by burning the leaves in the manner of Paris green. It must be used when there is no wind, and when the dew is on the plants.—*V. G. J.*

Asparagus Miner and the Twelve-spotted Asparagus Beetle, The. By D. E. Fink (*U.S.A. Agr. Exp. Stn., Cornell, Entom. Bull.* 331, April 1913; 20 figs.).—The asparagus miner (*Agromyza simplex* Loew) is a native American species which is responsible for much of the damage usually attributed to centipedes and wireworms.

The twelve-spotted asparagus beetle (*Crioceris duodecimpunctata* L.) is of European origin and feeds on the stalks, branches, and berries of the asparagus. Arseniate of lead destroys both of these pests.

V. G. J.

Bamboos. By Dr. Carl Curt Horséns (*Beih. Bot. Cent.* xxx. Abt. 2, Heft 1, pp. 1-69, October 1913, with 12 figs.).—The author gives in this paper a vast amount of miscellaneous information regarding bamboos, for the most part collected from Watt, Munro, Gamble, and other authorities, but he includes a few observations made by himself in Siam.

He gives, *e.g.*, a list of the species seen by him in various herbaria ; he also details observations showing the extraordinary rapidity of growth of certain kinds. *Oxytenanthera abessinica*, *e.g.*, grew 3 feet 5½ inches in a week, and others over ten inches in two days.

In Siam bamboos occur on nummulitic limestone, archæan rocks, and flood lands chiefly, but elsewhere seem to appear as secondary woods in places where the primitive parent has been cleared.

There is also a long discussion on the flowering of bamboos. Many flower in the Indo-Malayan region at an age of 25-35 years. There seem to be three groups of bamboos. There are annually-flowering species, others which flower irregularly, and a third group in which all the descendants of one seed period appear to bloom together, after which the culms and frequently the rhizome itself die. Whether this is exactly the case or not does not seem to be clearly made out, but the author gives numerous references and conflicting opinions on the point.

Certainly a particularly hot and dry year which makes the rice crop a failure frequently brings about a profuse flowering of the bamboos, so that in a famine year there is often an abundant supply of bamboo seed, which is of the greatest possible value to the natives.

The author describes the manna found, though rarely, on the outside of the bamboo shoot, and caused by insect injury, and the tabaschir found within the shoot and which is used medicinally. A large part of the paper deals with the various uses of the bamboo. Water is found within the internodes ; fresh green stems thrown on the fire burst explosively, and are said to have been used to frighten off wild beasts. These uses are too various, however, to be given in detail, so that we shall merely mention some of the most outstanding, as, *e.g.*, clothing, hats, fans, flasks, combs, brooms, toothpicks, cooking pots, beer mugs, stools, musical instruments, measuring rods, hockey balls, arrows and bows, shields, poles, baskets, houses, rafts, bridges, irrigating pipes, and so on indefinitely. (We have not noticed any reference to the head-hunter's knife, which is a sliver of bamboo, or to the method of lighting a fire by friction of bamboos.) Details are also given of the yield of bamboos from an acre in view of their plantation on a large scale for papermaking. These last are quotations from Raitt and Lindall.—*G. F. S. E.*

Basic Slag, The Wagner Test as a Measure of the Availability of the Phosphate in. By H. E. Jones (*Jour. Bd. Agr.* vol. xxi. No. 3, pp. 201-206).—Basic slag is frequently sold on the basis of its "citric solubility," *i.e.* the percentage of phosphate which

passes into solution when the slag is shaken with a 2 per cent. solution of citric acid under conditions defined by Wagner, who first proposed the test. The utility of this method of valuation has been called in question in recent years, for it has been said that the phosphate which remains undissolved under the prescribed conditions has considerable fertilizing value and should therefore be taken into account in the valuation. The article deals with some preliminary investigations which have been carried out in the laboratory of the Department of Agriculture, University College, Bangor, and on a field scale at various centres in North Wales, to elucidate the problem.

It is pointed out, among other things, that the amount of free lime in modern slags is much smaller than is commonly supposed. Statements are frequently made that basic slag contains 15 to 20 per cent. of uncombined lime. This may have been approximately true of the slags produced years ago, but in slags of modern origin the amount of free lime present is, on an average, approximately 2 per cent., and very seldom exceeds 5 per cent. This fact, however, is not of such great importance from an agricultural point of view as it might appear to be at first sight, for there is strong evidence to show that, although the amount of caustic lime present is small, a large proportion of the combined lime in basic slag is present in such a loose form of combination that it is capable of acting as a base in the presence of acids.

It is shown that there are at least two factors which influence the solubility of the phosphoric acid of slag:—

(a) A chemical factor: the actual form of combination in which the phosphoric acid exists in the slag. The phosphoric oxide occurs in slag in combination with a number of other oxides, of which silica is usually one. These complex compounds differ widely from one another in their solubility in dilute acids, some possessing the same order of solubility as tricalcium phosphate, while others dissolve with readiness.

(b) A physical factor: the extent of surface exposed to the solvent by the slag particles. The physical factor is of the greatest importance in the case of those slags which contain their phosphoric acid in the most soluble form, whilst in the case of slags rich in readily soluble constituents the fineness of grinding may not be so important as is commonly supposed.

The results of some tests made with slags are given, and in one case, although only a little over 50 per cent. of the phosphate dissolved in a 2 per cent. citric acid solution when extracted by the conventional Wagner method, nearly 90 per cent. had dissolved after six such extractions. It is thought possible that the phosphate which dissolved in the second and subsequent extractions would have been just as available to the plant as that which dissolved in the first extraction, and "it is conceivable that a slag which yields only a low percentage of its phosphate when extracted by the Wagner method may be quite as valuable to the plant as a slag yielding a high percentage."

As the whole matter is one which can only be settled by actual experiments with plants, some were commenced at various centres in 1913. The fertilizers used were two slags and a mineral phosphate. Data regarding them are given. They were applied to different plots in such quantities that each received the same "total phosphate," though, of course, the quantities of "citric-soluble phosphate" supplied were widely different. Although it is not possible to draw definite conclusions from one season's experiments, it may safely be said that the results obtained in 1913 clearly indicate that the percentage of "citric-soluble phosphate" in a slag is, at least, a better indication of the value of the slag than the percentage of "total phosphate." This, of course, does not necessarily imply that it is the best test. Results obtained with the mineral phosphate suggest the possibility that even a better measure of the availability of the phosphate to the plant is the amount dissolved in two or three extractions. Further investigations, however, are required before a definite opinion can be expressed on this point.—A. S.

Bean, A New. By G. F. Freeman (*Bot. Gaz.* Nov. 1913, pp. 395-417; with 11 figs.).—The south-western part of the United States is characterized by great aridity and extreme heat. Much progress has been effected in acclimatizing alfalfa, barley, white Sonora wheat, olives, figs, dates, citrus, &c. Even now the beans cultivated by the Pima and Papago natives seem to withstand the peculiar climate better than other varieties.

Of the former, the "frijole" is a form of *Phaseolus vulgaris*, but the "tepary" is said to be derived from a wild plant, and, according to the author, is a variety of *Phaseolus acutifolius* Gray. This variety is described and figured. The "tepary" in this district yields, on an average, four times as much as kidney beans.

It is well adapted to "dry farming" on account of rapid germination with but little soil moisture. If once established it withstands protracted seasons of water famine. It is inured to the great extremes of summer temperature in Arizona, and blooms and sets seeds in any month from May to November.

"As a dry-land crop in the south central plains and Rocky Mountain region, the tepary will in the near future in all probability find a place of considerable economic importance."—G. F. S. E.

Beans, Inheritance of Blossom Colour in. By J. K. Shaw (*U.S.A. Exp. Stn., Mass., Ann. Rep.* 1912, p. 182, Jan. 1913).—No generalizations are attempted, but a long series of crosses have been made, and the results obtained tabulated. The flower colours recognized are white, light pink, pink, and crimson, and the author considers that blossom colour is closely correlated with seed-coat colour.—F. J. C.

Beet Caterpillar, The Striped. By H. O. Marsh (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 127, part ii. May 1913; 1 pl. 2 figs.).—

Among the caterpillars which infest sugar beets in the Arkansas Valley in Colorado and Kansas is the so-called garden Mamestra or clover cutworm (*Mamestra trifolii* Rott.). It is usually considered a minor pest, but occasionally causes considerable trouble.

In the Arkansas Valley the larvæ were found on two plants only—sugar beet and *Chenopodium album*, the former apparently being the favourite. Ordinarily it is kept in check by cultural methods and natural enemies, but when, as sometimes happens, it develops in injurious numbers the larvæ can be efficiently dealt with by spraying with Paris green.—V. G. J.

Beet Webworm, The Spotted. By F. H. Chittenden, Sc.D. (U.S.A. Dep. Agr., Bur. Entom., Bull. 121, part i. May 1913; 4 pl.).—The spotted beet webworm (*Hymenia perspectalis* Hübn.) has on two occasions attracted the writer's attention from its occurrence on beets in the District of Columbia. It is remarkable that, although it was first observed in 1905, its presence was not again noticeable until 1912, when it became a veritable pest.

It may be classified both as an enemy to sugar beet and as an insect injurious to both garden and greenhouse ornamental plants.

There is no proof yet that as far north as the District of Columbia this species will in the near future renew attack or become as bad a pest as in 1912, but the possibility exists and a close look-out will be kept for its reappearance.—V. G. J.

Belladonna Plants, Individual Variation in the Alkaloidal Contents of. By A. F. Sievers (Jour. Agr. Research, i. pp. 129-146, Nov. 1913).—The author finds the most profitable time to pick the leaves of *Atropa Belladonna* is from the time of flowering until the early berries begin to ripen. A greater percentage of alkaloid is present later, but the leaves are then smaller. No relation was found between the physical character of the plant and the percentage of alkaloid present. The percentage of alkaloid appears to be fairly constant from year to year in the same plant, but the variation of the percentage of alkaloids in the leaves of different plants is exceedingly large.—F. J. C.

Berberis Pratii (Bot. Mag. tab. 8549).—Western China. Nat. Ord. Berberidaceae, Tribe Berberideae. Shrub, 6-10 feet high. Leaves 1½ inch long. Panicles 2 inches long. Flowers yellow, ¼ inch across. Berry, ellipsoid, salmon-red.—G. H.

Bidens. By Earl E. Sherff (Bot. Gaz. Dec. 1913. pp. 490-495).—The author describes five new species of *Bidens*, and refers to this genus several *Coreopsis* spp.—G. F. S. E.

Blackberry, Himalaya. By H. P. Gould (U.S.A. Dep. Agr., Bull. 116, pp. 23-26).—The Himalaya blackberry (Luther Burbank's strain) is said to be a success in the Puget Sound region of Washington. In sections of the Rocky Mountains it is a rank grower, poor cropper, with fruit of inferior flavour.—S. E. W.

Blueberry Culture. By F. C. Ville (*U.S.A. Dep. Agr., Bull.* 122, 1913, pp. 3-11).—The Blueberry (*Vaccinium*) likes an acid soil, preferably a mixture of peat and sand, with good drainage and moderate soil moisture. Two methods of propagation are in use, viz. stumping and tuberling.

Stumping.—The plant is cut off at the surface of the ground in early spring. Cover the stumps with a mixture of sand and peat (4 to 1) to a depth of three inches. Do not allow the bed to become dry, and mulch with leaves in cold weather. Early next spring sever the shoots from the root stock, cut off the upper portion of the shoots and use for tuberling. The lower parts are planted in pots in a mixture of peat, sand, and broken crocks (2 : 1 : 1). Place in a cold frame, shade, and water frequently. Re-pot in summer.

Tuberling.—Lay the cuttings horizontally in a box of sand and cover with sand to a depth of two inches; keep at a temperature of 55° to 65° F. in the shade. In a few weeks a new growth appears above the sand; when this reaches a height of an inch, add half an inch of peat and sand and water. The rooted shoots are potted.

S. E. W.

Bordeaux Mixtures, Some Factors Influencing the Efficiency of. By Lon A. Hawkins (*U.S.A. Dep. Agr., Bur. Plant. Ind., Bull.* 265, Dec. 1912; 4 figs., 4 tabs.).—The points especially sought in this investigation were the uniform distribution of the copper compound in the material while in use and its adhesion to the foliage, &c.

The authors showed that the method of preparing Bordeaux mixture considerably modified its suspensibility in water. The materials tested for capacity of giving increased adhesiveness included soap, glue, sugar, dried blood, gelatin, and resin sprayed upon grape leaves and berries. It was found that the surface tension of the liquid had no direct bearing upon the point.

Resin fish oil soap increased the adhesiveness slightly upon the leaves and materially upon the berries, and was the most effective material tried. 2 lb. to 50 gallons proved the best proportions. Glue and fish oil soap also showed benefit.—W. A. V.

Brown Rot of Fruits. By W. A. Matheny (*Bot. Gaz.* Nov. 1913, pp. 418-432; with 6 figs.).—The author, as a result of 300 experiments on different fruits, finds that the local brown rot agrees with *Sclerotinia cinerea*. The European *S. fructigena* never produces the same results as the local form.—G. F. S. E.

Brown-tail and Gypsy Moths and Parasites, The. By E. E. Philbrook (*U.S.A. Exp. Stn., Maine, Quart. Bull.* Dec. 1913; 11 plates).—The author gives the life-history of both these moths, and describes at length methods used to rear their parasites.—V. G. J.

Brown-tail Moth, The. By W. E. Britton (*U.S.A. Exp. Stn., Conn., Bull.* 182, March 1914, Entom. Series 20; 16 figs.).—The larvæ feed on many trees, but prefer fruit trees. Oak, maple, and elm are also attacked. A fungus in wet seasons kills many of the caterpillars.

Cutting off and burning the nests in winter and spraying foliage in August with lead arseniate are the methods most in use on fruit trees. This, however, is not practicable in the forests.—V. G. J.

Bud-Scales, Anatomy of. By Eduard Brick, Crefeld (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 2, pp. 209–308, Dec. 1913; with 2 pls.).—The special aim of the author was to compare the anatomy of the bud-scales with that of ordinary leaves. He examined fourteen types (*Euonymus*, *Dictamnus*, *Lonicera*, Ash, *Aesculus*, *Viburnum*, *Acer*, *Prunus*, *Smilax*, &c.). Each type is described minutely. He concludes that bud-scales resemble leaves closely in origin, development, and final condition. Yet, though the inner scales resemble leaves arrested in development, the outermost oldest scales are leaves "divergently developed." In the former, the microchemical structure of epidermis and mesophyll cells as well as the intercellulars resemble those of ordinary leaves. But the latter have developed on different lines, starting at a very early condition of the leaf, and show three distinct morphological groups.

The scales may originate from the rudiment of (a) a whole leaf, (b) a leaf-base (*Blattgrund*), or (c) a leaf in which stipules are already developing.

The division of the corky tissue is usually such that the interior of the bud is enveloped in a simple or many-layered, closed sheath of cork cells.

The vascular tissue is almost always reduced in the outer bud-scales.

G. F. S. E.

Carbon Tetrachloride as a Substitute for Carbon Bisulphide for Fumigation against Insects. By F. H. Chittenden and C. H. Popenhoe (*U.S.A. Dep. Agr., Bull.* 96, pt. iv. 1912).—Carbon tetrachloride was found to be quite unsatisfactory for above purposes, as it was only half to one third as effective, while the cost was double.

C. P. C.

Carpinus japonica (*Bot. Mag.* tab. 8534).—Central and Southern Japan. Tree, 50 feet high, trunk 5 feet in girth. Leaves 2–4½ inches long. Catkins 2 inches long; bracts ¾ inch long, toothed. Stamens numerous, with purplish anthers. Nutlet ¼ inch long, attached at the base to a bract.—G. H.

Chalcids Injurious to Forest Tree Seeds. By S. A. Rohwer (*U.S.A. Dep. Agr., Bur. Entom., Tech. Series* 20, part vi. Feb. 1913).—Up to the present time there are seven species of chalcidid flies which are known to attack the seeds of certain forest trees (principally conifers).

Of these seven species the eggs of two are known, the larvæ of four, the pupæ of two, the oviposition habit of one, and the emergence dates of three. The only species of which the life-history has been completely traced is that of the apple-seed chalcidid (*Syntomaspis druparum*), which is also known to attack the seeds of mountain ash.—V. G. J.

Cherry, A Preliminary Report on the Pollination of the. By V. R. Gardner (*U.S.A. Exp. Stn., Oregon, Bull.* 116, Aug. 1913; figs.).—All the varieties of cherry tried, including 'Bing,' *'Black Republican,' 'Black Tartarian,' 'Coe,' 'Early Purple,' 'Elton,' 'Knight,' 'Lambert,' *'Major Francis,' 'May Duke,' 'Napoleon,' *'Rockport,' 'Waterhouse,' 'Williamette,' 'Windsor,' and 'Governor Wood,' were found to be self-sterile, and those marked * were intersterile. Some members of the 'Duke' group and some of the sour cherries (*Prunus Cerasus*) are capable of fertilizing some of the Bigarreaus. Intersterility does not depend upon closeness of relationship between varieties, nor is fertility entirely dependent upon the kind of pollen available. Environmental influences are also important. 'Black Republican,' 'Black Tartarian,' and 'Waterhouse' gave the best results with their pollen, other varieties being variable in their effects.—F. J. C.

Cherry and Plum, Yellow-leaf Disease of. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Circular* 21, January 1914, pp. 1-10; 9 figs.).—This disease is very destructive to all varieties of cherries, and may cause entire loss of foliage. Sweet-cherry varieties are often more seriously attacked than the sour varieties. European plum varieties are also badly attacked, though the Japanese plums are more resistant to the disease.

The leaves are most frequently attacked, though the fruit may occasionally be affected. The disease causes numerous holes to appear in the foliage, producing "shot-hole" appearance. This is characteristic of the disease in plums, but it is not so marked in the case of cherry trees.

The disease is caused by a fungus (*Cylindrosporium padi*). It is suggested that spraying with Bordeaux mixture (5-5-50 strength) or lime-sulphur solution (1 gallon in 50 gallons of water) reduces the disease considerably.—A. B.

Cherry Fruit Flies and How to Control Them. By J. F. Illingworth (*U.S.A. Exp. Stn., Cornell, Dep. Entom., Bull.* 325, Dec. 1912; 22 figs.).—Poisoned bait composed of arseniate of lead, 3 oz. or 5 lb.; cheap molasses, 1 pt. or 3 gallons; water, 4 gallons or 100 gallons, has been found very effective when sprayed on the trees twice, the first time June 10, the second June 24.—V. G. J.

Cherry Fruit Saw-fly, The. By S. W. Foster (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 116, pt. iii., Jan. 1913; 2 figs., 2 pls.).—The female saw-fly (*Hoplocampa Cookei*) deposits her eggs singly in

the sepals of flowers just about to open. The larva eats directly into the newly formed cherry and devours the small kernel. In two to four days the larva undergoes its first moult, leaves the first cherry and attacks a second one, destroying the kernel as before. It usually destroys three cherries in from 22 to 26 days, after which it constructs a parchment-like cocoon 3 to 7 inches below the surface of the ground. There is only one brood each year. Experiments in control are being conducted to discover an efficient spray.—V. G. J.

Cherry 'Schmidt.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A German variety raised about 1850, and remarkable for its healthy growth and free-cropping qualities.

E. A. Bd.

Chestnut Blight. By C. L. Shear and N. E. Stevens (*U.S.A. Dep. Agr., Bull.* 131, 1913, pp. 3-18).—The fungus of chestnut blight (*Endothia parasitica*) is closely related to *E. radicalis*, *E. radicalis mississippiensis*, and *E. gyrosa*. *E. parasitica* gives a characteristic granular orange-coloured surface growth on potato agar. It usually appears within a week.—S. E. W.

Chestnut Blight Fungus in Soil, Longevity of Pycnospores of. By F. D. Heald and M. W. Gardner (*Jour. Agr. Research*, i, pp. 67-75).—In dry weather the pycnospores retain their power of germination for from two to 13 days, but indoor experiments showed that many lived under dry conditions for four or five months. They probably, therefore, live in the dry soil for a very long time, and are capable of infecting the trees therefrom.—F. J. C.

Cistus, Hybrid. By Ed. Bornet and M. Gard (*Beih. Bot. Cent.* xxxi. Abt. 2, Heft 3, pp. 373-428).—An enormous number of hybridization experiments were carried out by Bornet in 1863 to 1866. So far as one can gather from this paper (it is nowhere clearly stated), M. Gard has examined microscopically the herbarium specimens preserved by M. Bornet, and adds to the latter's manuscript notes any details observed by himself. The hybrids are for the most part complex; all appear to be sub-species of *Cistus polymorphus*. The sign \times means "pollinated by." Of three-quarter hybrids, e.g., there are (*C. villosus* \times *albidus*) \times *C. albidus*, (*C. alb.* \times *vill.*) \times *C. alb.*, *C. alb.* \times (*C. vill.* \times *C. alb.*), *C. vill.* \times (*C. alb.* \times *C. vill.*), (*C. alb.* \times *C. vill.*) \times *C. vill.*

Three-quarter hybrids were also crossed with themselves and with other three-quarter hybrids, and combinations of three and also of four different sub-species are described.

The results showed extraordinary variations and many intermediate forms. No general or precise conclusion could be drawn from reciprocal crossings of three-quarter hybrids, partly because of the very different number of individual plants, and partly because they varied in different crossings of the same kind.

Amongst the descendants of the cross ($a \times b$) \times a there appeared

not only ab (which is not the same as ba) but b . This is not in accord with the views of Mendel. So also $(a \times b) \times c$ yielded other descendants besides ac , bc , and abc , such, e.g., as the form $a \times b$. This survival of the mother-hybrid is common enough, more usual than that of father or mother in binary crosses.

Also $C. salvifolius \times (C. populifolius \times C. salvifolius)$ gave: (1) Intermediates with predominance of hybrid father; (2) intermediates between the two parents; (3) plants approaching but not identical with $C. salvifolius$; (4) plants scarcely distinct from $C. salvifolius$.

In very few cases does there seem to have been any distinct and definite isolation of one of the parent sub-species. Microscopic examination showed, in by far the most examples, characters such as form or arrangement of hairs, colour of flower &c., which belonged or in part belonged to one or other parent.—G. F. S. E.

Citropsis, an African Genus Allied to Citrus. By W. I. Swingle and M. Kellerman (*Jour. Agr. Research*, i. pp. 4194–36, Feb. 1914; figs.).—A new genus is formed to contain the African ‘cherry oranges,’ *Citropsis Schweinfurthii* (= *Limonia Schweinfurthii*, *L. ugandensis*, and *L. Poggi*) being the type, the other species included being *C. Preusii* (= *L. Preusii*), *C. gabuncensis* (= *L. gabunensis*, *L. Lacourtiana*?). *C. mirabilis* (= *L. mirabilis*), *C. articulata* (= *Citrus articulata*). It is suggested that some of these species might be usefully employed in hybridizing, and that they may be readily grafted on species of *Citrus*, tabog (*Chaetospermum glutinosa*), and the wood-apple (*Feronia elephantum*).—F. J. C.

Citrus White Fly, Report of a Trip to India and the Orient in search of the Natural Enemies of the. By R. S. Woglum (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 120, Feb. 1913; 12 plates, 2 figs.).—This bulletin has been prepared with the idea of presenting some of the more important phases, from a scientific point of view, of a journey made in search of parasitic and predatory enemies of the citrus white fly (*Aleyrodes citri* R. & H.). The result of the trip was to bring to light two hitherto unknown specimens of natural enemy (viz. the larvæ of a coccinellid, identified by Mr. E. A. Schwarz as *Cryptognatha flavescens* Motch) and an internal parasite of the white fly identified by Dr. Howard as belonging to the genus *Prospatella*, of the hymenopterous subfamily Aphelininae.—V. G. J.

Clinostat Researches and Statoliths. By Ferdinand Dawers (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 3, pp. 309–357; with 8 figures).—The experiments detailed in this paper were carried out with Piccard’s apparatus, and refer to the localization of geotropic sensitiveness in roots and seedling stems. When opposite stimuli are applied to the root tip and base of *Lupinus albus* seedlings, it is the tip which prevails. *Helianthus* proved unsuitable.

The internode of various grass seedlings was found to be sensitive

to the action of gravity, though not so much so as the Coleoptile. The reader must, however, be referred to the original for details of this research.

The author also tested the effect of aluminium salts in removing starch from plants, but comes to the conclusion that this method cannot be used as a control of the statolith theory.—*G. F. S. E.*

Coastal Subsidence and Buried Forests. By Douglas Wilson Johnson (*Bot. Gaz.* Dec. 1913. pp. 449-468; with nine figs.).—The author shows how the formation or washing away of a barrier reef may lead to false conclusions as to elevation or subsidence of the coast-line.—*G. F. S. E.*

Codling Moth, The Calliephialtes Parasite of. By R. A. Cushman (*Jour. Agr. Research*, i. p. 211-238, Dec. 1913; pl.).—The life-history and habits of this insect, *Calliephialtes messor*, parasitic on the codling moth, are described.—*F. J. C.*

Colloidal Metals on Spirogyra, Effect of. By W. D. Hoyt (*Bot. Gaz.* lvii. pp. 193-212, March 1914); with 4 figures.—Solutions of 90 and 96 parts in a million of colloidal gold and platinum respectively were almost without effect, whilst even 00225 parts in a million of colloidal silver were injurious, and anything above 045 parts in a million proved fatal.

Low concentrations of the first two mentioned metals (and in a less degree of colloidal silver) partially prevented injury to *Spirogyra* filaments by NaOH.

The author also investigated the gelatinous swelling of the outer cell-walls of *Spirogyra* produced by colloidal gold or platinum and NaOH.

Spirogyra filaments of the same culture, but grown in different media, reacted differently in various toxic solutions.—*G. F. S. E.*

Colorado Potato Beetle, Zinc Arsenite and Lead Chromate as Remedies against. By F. A. Johnson (*U.S.A. Dep. Agr., Bur. of Entom., Bull.* 109. pt. v. 1912).—Lead chromate, either alone or mixed with fungicide, gave very poor results, while zinc arsenite compares very favourably with lead arseniate against the above pest.

The best results with zinc arsenite were obtained with a solution of 2 lb. to 50 gallons of water, and the author suggests that even higher strengths may be used with safety.—*C. P. C.*

Cost of Production, The Determination of. By C. S. Orwin (*Jour. Bd. Agr.*, vol. xxi. No. 3, pp. 193-201).—The great importance and need of investigations leading to the determination of the cost of the production of agricultural produce is dealt with at some length. The necessity for uniformity of method, and the uselessness of results arrived at by differing methods, are pointed out. It is also clearly shown that when a home-grown product (e.g. hay or straw) is consumed

its value should be calculated from its cost, and not from the market price. The argument in favour of using market prices instead of cost in the determination is, of course, that thereby a comparison can be made of the relative advantages of selling and consuming home-grown produce. But so long as the cost of production is determined this comparison can be made without introducing fictitious values into the accounts.—A. S.

Cotoneaster turbinata (*Bot. Mag.* tab. 8546).—China. *Nat. Ord.* Rosaceae, *Tribe* Pomeae. Shrub, 6 feet high. Leaves ovate-lanceolate, $1\frac{3}{4}$ inch long. Inflorescence many-flowered. Flowers $\frac{1}{2}$ inch across, white, anthers purple. Fruit, 2 inches long, crimson.—G. H.

Cotton, Abortion of Fruiting Branches. By O. F. Cook (*U.S.A. Dep. Agr., Bull.* 118, pp. 11–16).—The cotton plant bears its fruit on specialized fruiting branches, not on the main stalks and upright vegetative branches. When there are too many upright shoots the horizontal fruiting branches cannot develop normally and are buried in shade. Many of the young bolls fall off, and the remainder are undersized and open prematurely. The conditions that favour luxuriant growth of the vegetative branches are inimical to the development of the fruiting branches.—S. E. W.

Cotton, Self-pollination. By R. M. Meade (*U.S.A. Dep. Agr., Bull.* 121, 1913, pp. 29–30; 1 fig.).—To prevent cross-pollination in cotton, the buds may be covered with paper bags for a few days, or they may be prevented from opening by (a) a spiral of fine copper wire; (b) a rubber band; or (c) an ordinary paper clip bent in the shape of the letter W. The clip holds the petals lengthwise and allows the buds to expand, but not to open.—S. E. W.

Cranberry Cultivation. By H. J. Franklin (*U.S.A. Exp. Stn., Mass., Ann. Rep.* 1912, p. 209, Jan. 1913).—An account of the conditions of growth and results of an experimental cranberry plot is given.—F. J. C.

Currant-cane Necrosis, An Experiment on the Control by Summer Pruning. By F. C. Stewart (*U.S.A. Exp. Stn., Geneva, N.Y., Bull.* 357).—Necrosis of currant canes caused by the fungus *Botryosphaeria ribis* is characterized by the sudden wilting and dying of canes here and there. Short sections, 1–4 inches, of the bark and wood are attacked, discoloured, and killed, thereby causing the death of all parts above the point of infection.

The fungus was described by Duggar in 1911.

The wood and pith are filled with the mycelium of the fungus, and consequently the water supply to the cane above the injury is stopped. With a lens a fine whitish cobwebby mycelium can be observed in the discoloured pith.

Experiments were carried out to see if summer pruning of all diseased canes would control the disease, but the results were decidedly negative.—D. M. C.

Currant 'Diploma.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A variety remarkable for its juiciness and transparency. Raised by the late Jacob Moore, of Brighton, New York, in 1885.—*E. A. Bd.*

Currant Felt-Rust (*Cronartium ribicola*). By F. C. Stewart and W. H. Rankin (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 374, February, 1914, pp. 41-54; 3 plates, 1 map).—A series of experiments devised to determine whether *Cronartium ribicola* passes the winter on the currant. These gave negative results; hence the authors conclude that the fungus rarely, if ever, winters on the currants. This fungus passes a period of its life on pine trees, where it causes "blister-rust" and is then known as *Peridermium Strobi* Kleb.—*A. B.*

Currant 'Perfection.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A seedling from 'Fay's Prolific,' which it excels in the size of the fruit. Raised by Mr. Hooker of Rochester, New York, in 1887. This must not be confused with a red currant of the same name recently introduced by Messrs. Laxton.
E. A. Bd.

Dahlias, A Botrytis Disease of. By M. T. Cook and C. A. Schwarze (*Phytopathology*, iii. p. 171, June 1913; figs.).—The disease attacks the roots, causing the interior to be soft and wet, and to turn yellow, brownish, or finally black. It is most severe under warm, moist conditions, combined with poor ventilation. The fungus is regarded as *Botrytis cinerea*; it is thought that infection takes place through wounds, and finally sclerotia are produced.—*F. J. C.*

Date Palm, Growth of the. By A. E. Vinson (*Bot. Gaz.* April 1914, pp. 324-327; 1 fig.).—The author, taking the sum of the elongation of the inner five leaves as measure of rate of growth, observed the daily growth of four date palms at Tempe, Arizona. Growth is most active at about 1 or 2 P.M., and at that season in which there is the highest minimum temperature. This is the summer period of highest relative humidity. The rate of growth throughout the year is in most cases in proportion to the heat-time units over 50° F.

The ripening of fruit is probably affected by the same factors. At Gafsa, in South Tunis (1126 feet), only second-quality dates are grown, for in that district there is 30°-35° F. difference in night temperature; the finest dates grow in the Djerid (197 feet alt.), where there is no such difference.—*G. F. S. E.*

Deutzia mollis (*Bot. Mag.* tab. 8559).—China. *Nat. Ord.* Saxifragaceae, *Tribe* Hydrangeae. Shrub, 2-5 feet high. Leaves ovate, 3 inches long. Inflorescence many-flowered, corymbose, 4½ inches across. Corolla white, flushed with pink.—*G. H.*

Distribution of Conifers and Ferns in Germany, The. By F. Höck (*Beih. Bot. Cent.* xxxi. Abt. 2, Heft 1, pp. 77-110).—The author gives a useful table showing the distribution of the German vascular Cryptogams and Gymnosperms throughout Europe, the Alps, the German Empire, and in its various provinces. The range of practically every one of these species is then described, and their affinities discussed. Two species of *Azalea* seem to have established themselves in Germany, as well as *Salaginella apus*.

Foresters should find the distribution here given in detail of Scots Pine, Spruce, Silver Fir, and Larch of great interest, especially as the author refers to most of the recent authorities on the subject.

The author concludes that all German Conifers appear to be of northern origin. In this they contrast with the vascular Cryptogams, of which many are cosmopolitan, although (except *Equisetum arvense*) they are not weeds. The Yew appears to be an ancient type now in process of extinction.

The majority of North German plants entered from the south to east. Only the Atlantic or Atlantic-Mediterranean forms wandered from west to east.

The author also contrasts the distribution of *Carex* and Orchids. *Carex* appears to be the older group. Of the German species four are cosmopolitan and sixteen cross the Equator.

The Orchids of Germany contain genera which also cross the tropics, but most of them seem to be of northern origin.

Equisetum does not seem (in its present form) to be of the same great antiquity as the other vascular Cryptogams.—G. F. S. E.

Dune Plants of Holland. By Dr. J. Jeswiet (*Beih. Bot. Cent.* xxxi. Abt. 2, Heft 2, pp. 322-372).—The author gives particulars of the climatic peculiarities of the Dutch sand-dunes specially with regard to light (strong sunshine), soil temperature, humidity, rainfall, and wind; he also describes the physical properties of the soil, which is very different in the old as compared with young dunes.

Fresh water accumulates in a sort of "sack" surrounded by salt water, and is found to a depth of 130 mètres. It is at about 1 to 4 mètres below the surface.

The author, following Massart, divides the flora into the following groups:—(a) Plants (annual or biennial) which are in leaf during winter (*Anthriscus silvestris*, *Phleum arenarium*, &c.), and with seeds germinating in autumn. (b) Similar but perennial (*Ranunculus bulbosus*, *Orchis mascula*, &c.). (c) April-May flowering plants, not visible above the ground from June to the end of February (*Ranunculus Ficaria*, *Potentilla anserina*, &c.). (d) Perennials with no underground storage organs or runners (*Prunella*, *Thyme*). (e) Spring-flowering biennials with long roots (*Glaucium*, *Onopordon*). Many of this group, e.g. *Anchusa* and *Echium*, form rosettes on pieces of the root; some become perennial by forming buds in the axils of the leaves. Occasionally an axillary bud of a biennial rosette flowers in the first year

whilst the terminal bud is delayed till the following summer. (f) Plants resembling annuals or biennials in root system but perennials and assimilating in winter (Daisy, *Viola odorata*, &c.). (g) Perennials with underground rhizomes assimilating during the whole year (*Agropyrum*, *Rumex acetosella* &c.). (h) Similar to the above, but with two sorts of shoots, one arising in winter and dying in the autumn, and others beginning in autumn and dying in early spring (Yarrow, *Galium verum*). (i) A heterogeneous set which have leaves assimilating in winter, but gradually dying off before spring. (j) Annual summer plants (*Cakile*, &c.). (k) Perennials losing their leaves in autumn (*Rumex*, *Parnassia*, most trees). (l) All the remainder.

The shadow and sun forms of *Polygonatum officinale* are described, and also the various environmental forms of Bracken.

Calamagrostis Epigeios is characteristic of the fixed dunes.

Humulus Lupulus often destroys the trees on which it grows.

The paper contains many other details regarding the growth and habitats of dune plants, but these can hardly be given in an abstract.

G. F. S. E.

Electricity, Application of, to Plant Production. By J. H. Priestley (*Gard. Chron.* April 11 and 18, 1914, pp. 245-7 and 271; 4 figs.).—Based on experiments carried out by the University of Leeds and others, it has been ascertained that the electrical discharge from overhead wires is carried by wind, and therefore control areas contiguous to the electrified plots are affected sufficiently to render the experiments invalid unless the amount of electricity on each is known. In later experiments galvanized wire screens are being used to cut off some of the discharge.—E. A. B.

Elm-Tree Pests, Control of Two. By Glenn W. Herrick (*U.S.A. Exp. Stn., Cornell, Dep. Entom., Bull.* 333, May 1913; 18 figs.).—The pests here described are the elm-tree leaf-beetle (*Galerucella luteola* Müll.) and the elm-tree leaf miner (*Kaliotiphphinga ulmi* Sund.), the latter being the larva of a small sawfly.—V. G. J.

Epidendrum profusum (*Bot. Mag.* tab. 8551).—Mexico. *Nat. Ord.* Orchidaceae, *Tribe* Epidendreae. Herb, epiphytic. Leaves ligulate, 7-14 inches long. Flower 1½ inch across. Sepals and petals spreading, pale yellowish-green. Lip 3-lobed, white, streaked with purple.—G. H.

Erythrina pulcherrima (*Bot. Mag.* tab. 8532).—South America. *Nat. Ord.* Leguminosae, *Tribe* Phaseoleae. Tree to 30 feet. Leaves, pinnately 3-foliolate, leaflets 2½-3½ inches long. Inflorescence 3-flowered. Standard 2 inches long, 1½ inch wide. Keel, 1½ inch long, scarlet.—G. H.

Fern Caterpillar, The Florida. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 125, Oct. 1913; 1 fig.).—During recent years a species of caterpillar, *Eriopus floridensis* Guen, native

to Florida and tropical America, has made its appearance in injurious numbers in northern greenhouses, notably in the District of Columbia, in Illinois and Ohio. It is apparently restricted to ferns, on which it feeds naturally in its occurrence in the open in the warm South, and it has undoubtedly been introduced into northern greenhouses in ferns from Florida. Hand-picking, though somewhat laborious, has been found the best method of control.—V. G. J.

Feterita. By H. N. Vinall and C. R. Ball (*U.S.A. Dep. Agr., Bull.* 122, 1913, pp. 25–32).—*Feterita* is a new variety of sorghum, with stems from 4 to 7 feet high, erect heads, and large white grains. It resists drought better than any other kind of sorghum, and is equal to milo in yield.—S. E. W.

Figs, Abnormal Roots in. By F. A. Wolf (*Phytopathology*, iii. p. 115, Apr. 1913; figs.).—The occurrence of small roots on stems of figs growing in shade and kept close and moist is described. The author regards their formation as primarily a response to superabundance of moisture.—F. J. C.

Fire Blight Disease and its Control in Nursery Stock. By V. B. Stewart (*U.S.A. Exp. Stn., Conn., Circ.* 20; 1913).—Fire blight, the bacterial disease caused by *Bacillus amylovorus*, is a native disease of species of Pomeae indigenous to America.

It occurs on a number of hosts, pear, quince, apricot, apple, plum, species of *Crataegus*, mountain ash, service berry, and a few native species of apple. Plums and apricots are seldom affected, cherries and peaches not at all. The degree of susceptibility of different varieties of the above-mentioned fruit trees is to a great extent dependent upon the length of the period of active growth of the tree. Some fruit trees mature their wood much earlier in the season than others, and the disease is not so severe as on trees with long sappy growth. All parts of the tree are attacked, flowers, fruit, twigs, spurs, branches, and the disease sometimes passes down the trunk into the roots.

Disseminating agents are bees and other insects which visit the blossoms for honey and infect the nectaries, biting insects, and plant lice.

The affected parts turn brown and finally almost black, and drops of viscid, milk-like substance are exuded in moist warm weather. This milky substance gradually dries to the consistency of gum and turns a deep brown colour.

The general appearance of a diseased tree resembles green bush partially burned, and hence the popular name "Fire Blight." The organism develops rapidly during the early growing season of the host plant, and winters in the diseased tissues and in the gummy substance which has been exuded.

Sprays and blight remedies have proved ineffectual, but epidemics can be held in check by preventive measures and thoroughly clean sanitary conditions. The elimination of some of the disseminating

agents, such as plant lice and the tarnished plant bug, which does considerable damage, also the removal of all sources of infection, are necessary. Trees and nursery stock should be frequently inspected, as often as two to three times weekly, and any diseased portions pruned away and the cut disinfected with 1/1000 corrosive sublimate. Fire blight is one of the most destructive diseases with which American fruit-growers and nurserymen have to deal. It was first observed as early as 1780 in the Hudson River highlands of New York State, and it is now found throughout the United States and Canada.

The author of this circular describes the symptoms and spread of the disease in great detail.—D. M. C.

Fire Blight Disease in Nursery Stock. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Bull.* 329, April 1913; figs.).—Fire blight due to *Bacillus amylovorus* is widely spread in America. The symptoms have already been detailed in earlier abstracts. They are reviewed in the present publication, the organism is re-described, its life-cycle and modes of dissemination are detailed, and the importance of seeing that nursery stock is free from the disease is emphasized. Pear, apple, quince, apricot, plum, species of *Crataegus*, *Amelanchier canadensis*, *Pyrus americana* and some other American species of *Pyrus*, *Eriobotrya japonica*, and *Heteromeles arbutifolia* growing in the neighbourhood of orchards are all known to be liable to attack.

F. J. C.

Fires on Standing Hardwood Timber, Effect of Forest. By W. H. Long (*U.S.A., Dep. Agr., For. Serv., Circ.* 216, March 31, 1913).—One of the most injurious effects of small forest fires is the killing of the young growth and the destruction of the layer of leaves and mulch on the ground which protects the soil during heavy rain.

A. D. W.

Flowers, Biology of European. By Rob. Stäger (*Beih. Bot. Cent.* xxxi. Abt. 2, Heft 2, pp. 281–321).—The pollination of the following flowers is described in detail:—

Colchicum alpinum, *Gagea Liottardi*, *Allium victorale*, *A. Schoenoprasum*, *Lilium croceum*, *Crocus vernus*, *Castanea sativa*, *Thesium alpinum*, *Dianthus odoratus*, *D. vaginatus*, *Cerastium trigynum*, *Alsine sedoides*, *Anemone alpina*, *Ranunculus parnassifolius*, *Papaver Lecoquii*, *Biscutella laevigata*, *Hugueninia tanacetifolia*, *Hutchinsia alpina*, *Capsella*, *Draba*, *Arabis*, *Sedum* (4 species), *Saxifraga* (3 species), *Lieveria* (2), *Geranium columbinum*, *Linum* (2 species), *Viola cenisia*, *Epilobium alsinifolium*, *Loiseleuria*, *Androsace* (2), *Gentiana* (2), *Convolvulus* (2), *Myosotis alpestris*, *Veronica alpina*, and two others, *Erinus* and *Campanula* (7 species).

The author counted the number of flowers in a square space measuring 90 centimètres each way.

In one place, Col d'Emanay, 2100 mètres alt., he found 1716 single flowers in this area of which there were 1280 flowers of *Myosotis alpestris* alone; on the Salamey Alp, 1950 mètres Unterwallis, on stony soil,

probably an old lake or sea floor, he found in one place 5808 flowers (3780 of *Anthyllis vulneraria*) and in another 8876 (*Pedicularis* 5160 and *Galium asperum* 2960) in the same area. At the Col de Jorat there were 7200 single flowers of *Anthyllis* and in another place 2360 of *Cerastium latifolium*. All these "places" were of the same area 90×90 cm. *not to a square mètre*.—G. F. S. E.

Forestry (*Quart. Jour. of Forestry*, January and April 1914).—The account of the visit of several members of the Society to German forests under the leadership of Sir William Schlich is interesting reading and should be fraught with good results, as far at least as the economic management of woodlands is concerned. Other papers are "Ray Tracheids in *Sequoia sempervirens*," "Protomorphic Shoots in the genus *Pinus*," and "Chermes on Larch."—A. D. W.

Forestry (*Trans. R. Scot. Arb. Soc.*, vol. 28, pt. i. Jan. 1914).—There is little to interest the British forester in Part i. of volume 28; foreign matter such as "The State Forests of Saxony" and "Some Vegetable Types at High Altitudes" occupying the main portion of the work.

The article on "Timber Research Work at the Cambridge School of Forestry" is useful, particularly the chapter devoted to *Thuja gigantea* and Douglas Fir in mixture. Benmore estate, in Argyllshire, has always afforded good examples of carefully-conducted forestry, and Mr. M'Beath is to be congratulated on his excellent paper on these two coniferous trees, which, for afforesting purposes, have much to recommend them. It is indeed pleasing to know that both species are doing so well in Northern Scotland.—A. D. W.

Fragaria, A Preliminary Note on the Genetics of. By C. W. Richardson (*Jour. Gen.* iii. p. 171, Feb. 1914; plate).—The author found, when runner-producing plants were crossed with runnerless (*F. de Gaillon*), the runner-producing form is dominant, and in alpinus red fruit-colour is dominant to white. The monophyllous type is apparently recessive to the triphyllous. The garden hybrids are being experimented with, but their origin seems obscure (see, however, JOURNAL R.H.S. xxxix. p. 541) and no decided conclusions have been reached except that the author considers it probable that most of the characters of the plant, except perhaps the perpetual fruiting of some, are due to simple factors.—F. J. C.

Fruit and Truck Crop Pest, A New. By E. J. Vosler (*U.S.A. St. Com. Hort. Cal., Bull.* June 1913, vol. ii. No. 6; 3 figs.).—This insect, which has been named *Irbisia brachycerus* Uhler, and has been recently described by Mr. Hudeman as *Capsus solani*, belongs to the order Hemiptera. It does not appear to do very considerable damage, although it is occasionally found on rhubarb leaves.

Other pests noted in this bulletin include the walnut mealy bug, the corn worm, nematode worms, and mottled leaf. There is also a paper on the use of flour paste in lime-sulphur solutions in the control of the citrus red spider.—V. G. J.

Fruit Spot, Jonathan. By J. B. S. Norton (*Phytopathology*, iii. p. 99, Apr. 1913).—This spot is characterized by the development of small black spots under the lenticels. The author shows that they develop in apples and pears after the exposure for one night to slight fumes of ammonia, formalin, and perhaps sulphur. In red varieties of apples the black colour develops in a day or two after the injury, in pears very quickly. If fruits are kept moist there is no pitting, but if the atmosphere is dry pitting ensues.—*F. J. C.*

Fruit Tree Leaf-Roller, The. By John B. Gill (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 116, pt. v. March 1912; 5 pls., tables).—This pest, in its larval stage, is difficult to control on account of the way the larvæ feed, and also because it is very resistant to poison sprays. Experiments show that the best method is a very thorough application of a miscible oil at the rate of 1 gallon to 15 gallons of water during the dormant season to destroy the egg-masses.—*V. G. J.*

Fruit Tree Leaf Roller, The. By Geo. P. Weldon (*U.S.A. St. Com. Hort. Cal., Bull.* ii. 9 Sept. 1913; 9 figs.).—This pest, which is the larva of a moth (*Archips argyrosipila* Walker), is frequently reported as injuring the fruit and foliage of various trees in different parts of the country, after becoming so numerous that acres of orchards are defoliated and the crop ruined. Spraying with miscible oils in the winter has been found effective in destroying the eggs. Arseniate of lead, applied thoroughly, will kill the larva. It is usually necessary to spray a second time.

This bulletin also contains accounts of the red humped caterpillar, the fruit tree bark beetle, the potato tuber moth, and a new parasite of the black scale.—*V. G. J.*

Fruit Trees, Crown Rot of. By J. G. Grossenbacher (*U.S.A. Exp. Stn., Geneva, N.Y., Tech. Bull.* 23; 1913).—This bulletin contains records of a large number of field observations in various orchards and fruit farms, made with a view to ascertaining the causes which predispose fruit trees to crown rot in the States. Winter injury and wind seem to be important factors.

The histology is to be published in a later bulletin.—*D. M. C.*

Galtonia princeps (*Bot. Mag.* tab. 8533).—South Africa. *Nat. Ord.* Liliaceae, *Tribe* Scilleae. Herb, bulb globose. Leaves, 4-6, narrowly lanceolate, $1\frac{1}{2}$ foot long. Scape longer than the leaves. Flowers in a raceme, 1 foot long. Flowers bracteate, pedicels 2-3 inches long. Perianth subcampanulate. Tube, oblong, $\frac{1}{2}$ inch long, green; lobes, ovate, $\frac{3}{4}$ inch long, pale yellowish-green.—*G. H.*

Gas, Effects of Illuminating, on Vegetation. By G. E. Stone (*U.S.A. Exp. Stn., Mass., Ann. Rpt.* 1912, p. 45, Jan. 1913).—Water gas, coal gas, gasoline gas, acetylene gas are all very poisonous to plants. When exposed to gas poisoning through leakage into

the soil, the leaves turn yellow and drop, or become reddish brown and die without falling. Later the cambium dries, and with the phloem and cortex turns brown and disintegrates. The roots are the first to suffer, then the base of the tree. Various fungi and boring beetles speedily take up their abode in the dead tissues and hasten destruction. Characteristic odours are developed in trees destroyed by gas, and various chemical substances may be discovered in the dead tissues, which owe their origin to the gas absorbed. Illuminating gas does very great damage to foliage, different plants showing different degrees of damage from this source; but, as with most plant-poisons, under certain conditions it acts as an accelerator of plant-growth, and the author describes some experiments illustrating this phase of its action.

F. J. C.

Geotropic Stimulation, Chemical and Physical Changes in.

By Eva O. Schley (*Bot. Gaz.* Dec. 1913, pp. 480-489; with 6 figs.).—In a growing shoot, the acidity is greatest at the tip, decreasing downwards. When a shoot is geotropically stimulated, the concave side becomes at first relatively more acid. The acidity, however, afterwards decreases until the maximum is on the convex side.

When there is visible curvature, the two plants show equal acidity and remain so until the tip has passed the vertical plane, when the concave side again becomes acid. These changes are not parallel to the relative rates of growth of the two sides. The percentage of dry weight is greatest on the concave side.—G. F. S. E.

Geotropy of Flax. By Josef Pohl (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 3, pp. 394-409; with 21 figures).—The author describes the curious changes in flax during growth. During the juvenile period the stem shows distinct negative geotropy, which is displayed by the young stem itself and in the hypocotyl, beginning to act in the latter organ under the cotyledons and gradually affecting the lower part. Next follows the first period of nutation (due to thermotropy), during which the tip of the stem is bent over downwards. If the tip is cut off, it straightens itself, becoming upright, in about two hours. This period occupies 9-11 days. Next an inflorescence axis is produced, and, during this phase, transversal geotropism is more developed. Direct sunlight can now no longer induce the stem to straighten itself. But during this second phase the stem becomes upright at night. The next stage is that of flowering; each peduncle becomes vertically upright when the flower is pollinated, and the inflorescence-axis also becomes slightly more erect and nearly vertical as soon as the first two flowers are in fruit. The transversal geotropism of the flowering stage changes to marked negative geotropy in fruit. The advantage of this change lies partly in the better support of and partly in the better opportunity of distributing the fruit. Direct sunlight, however, overcomes transversal geotropy and the flower peduncle becomes more erect.—G. F. S. E.

Germination, Oxygen in. By Charles A. Shull (*Bot. Gaz.* Jan. 1914, pp. 64-69).—The author discusses the rôle of oxygen in germination, and shows that, with *Xanthium* seeds, an increase in the oxygen supply brings an immediate increase in the rate of oxygen absorption; also it brings about immediate germination.

Xanthium seeds with the coats removed were found to absorb from 2.57 times to 5.046 times as much as those which still had their coats intact. The author suggests that oxygen stimulates germination by increasing respiration. In some cases, though oxygen stimulates the germination, its relation to it is often irregular and inconstant. Sometimes increased oxygen pressure proves injurious.

There is also a discussion on the probable effect of oxygen in plant-life.—G. F. S. E.

Gipsy Moth, The Dispersion of the. By A. F. Burgess (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 119, Feb. 1913; 16 pls., 6 figs., and map).—The spread of the gipsy moth may be due to transportation of larvæ and egg clusters on lumber products, nursery stock, waggons, and driftwood which floats down the rivers in the spring. But the greatest dispersion is undoubtedly due to the fact that first-stage caterpillars are blown by the wind.

The character of the food has a very important bearing on the dispersion of this pest, because unless the larvæ that are blown by the wind are able to find suitable food plants they will not survive.

If, for instance, a number of first-stage caterpillars were dropped into a forest of solid pine, they would obviously not be able to establish a colony.—V. G. J.

Gladiolus Masoniorum (*Bot. Mag.* tab. 8548).—Tembuland. *Nat. Ord.* Iridaceae, *Tribe* Irideae. Herb. Leaves $1\frac{1}{2}$ feet long, $\frac{1}{2}$ inch wide. Raceme 1 foot long, lax. Spathes, green, $1\frac{1}{2}$ inch long. Perianth cream-coloured, with pale yellow throat.—G. H.

Gooseberry Mildew, New Facts concerning. By E. S. Salmon (*Gard. Chron.* May 16, 1914, p. 325).—Gives results of spraying experiments in Kent and declares the superiority of lime-sulphur over liver of sulphur, with names of varieties that benefit from it. Spraying should commence in mid-April and be continued fortnightly to within a month of picking fruit. Though adherent enough to mark berries, the lime-sulphur sediment is not harmful. Berries become mildewed in spite of spraying when ground has become infested with winter spores. To prevent this, berries with brown "winter stage" must not be allowed to remain on the bush, and diseased shoots should be tipped in August or September.—E. A. B.

Gooseberry 'Poor Man.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—An exceptionally vigorous and hardy variety; of great promise for commercial plantings.—E. A. B.

Grape Anthracnose, Experiments in the Control of. By Lon A. Hawkins (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 105; 1913).—Grape anthracnose is due to the fungus *Sphaceloma ampelinum*, and causes considerable damage in the vine-growing districts of the United States.

It attacks all the green parts of the plants, giving rise to cankers on the stems, and brown spots, surrounded by a well-defined, circular, bright-red zone, on the berries. Later the berries shrivel and die.

The fungus winters on the mummied berries and on the old wood.

The disease can be easily controlled by cutting out and burning all diseased parts, by spraying the dormant vines with concentrated lime-sulphur solution, one in ten gallons of water, and by spraying with Bordeaux mixture (4-3-50, 4-2-50, or 3-2-50) five times:—

(a) when the shoots are 8-12 inches long.

(b) just before and after flowering, and twice again at intervals of from ten to fourteen days.—*D. M. C.*

Grape 'Berchmans.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A hybrid raised by Dr. Wiley, of Chester, South Carolina. Recommended for small gardens.—*E. A. Bd.*

Grape 'Delago.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—One of the latest keeping varieties. The firmest-fleshed of all American grapes. Raised by the late Mr. Monson about 1883.—*E. A. Bd.*

Grape 'Eclipse.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364; plate).—Recommended as one of the most healthy, hardy, and productive sorts grown in the United States. Originated about 1890.—*E. A. Bd.*

Grape Leaf-Hopper, The. By F. Z. Hartyell (*U.S.A. Exp. Stn., New York, Bull.* 359, Feb. 1913; 6 plates, 3 figs.).—Spraying experiments during 1912 showed (1) that black leaf 40, one part to 1600 parts water or Bordeaux mixture, is an efficient spray for the leaf-hopper; (2) that fruit from vines protected from the hopper is superior to fruit from vines subjected to attacks from this pest.

Chemical analyses of grapes from sprayed vines gave a gain of from 8 to 68 % in sugar over those from untreated vines, while the unsprayed grapes had 0 to 20.6 % more acid than sprayed grapes.

V. G. J.

Grape 'Secretary.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—Highly recommended for commercial and private use. The result of a cross between 'Muscat Hamburg' and an American variety named 'Clinton'.—*E. A. Bd.*

Grapes, Crystallization of Cream of Tartar in the Fruit of. By W. B. Allwood (*Jour. Agr. Research*, i. pp. 513-514, March 1914).—The author found crystals of potassium tartrate very numerous in the soft tissue just within the skin of different varieties of grape.

F. J. C.

Grasshoppers. By J. S. Houser (*U.S.A. Exp. Stn.; Ohio, Circ.* 137, June 1913; 10 figs.). This circular deals mainly with *Melanoplus bivittatus* (Say) and *M. femur-rubrum* (De Geer).—V. G. J.

Greenhouse Crops, Malnutrition or Over-fertilization of. By H. D. Haskins (*U.S.A. Exp. Stn., Mass., Ann. Rep.* 1912, p. 71, Jan. 1913).—Symptoms indicating malnutrition are that plants, at first very vigorous, turn yellow prematurely and fail to develop fruit, leaves become more or less spotted (as in mosaic diseases), and no fungus is found to account for the trouble. The trouble appears generally after the use of the soil for two years in succession, and it is recommended that it should be leached out with hot water as soon as the crop is removed or symptoms of over-nutrition are observed. Mulching with three inches of fresh loam worked lightly around the plants has been known to promote the formation of new roots in diseased crops and to save them from destruction.

F. J. C.

Hibiscus Walmeae (*Bot. Mag.* tab. 8547).—Hawaiian Islands. *Nat. Ord.* Malvaceae, *Tribe* Hibisceae. Tree, 25 feet high. Leaves sub-orbicular, $3\frac{1}{2}$ to 8 inches long. Flowers solitary. Corolla, segments $4\frac{1}{2}$ inches long, white. Staminal tube, 6 inches long, red above, with free spreading filaments, 1 inch long.—G. H.

Hop Aphis in the Pacific Region, The. By William B. Parker, M.S. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 111, May 1913; 10 pls., 8 figs.).—The hop aphis is very destructive, and if not carefully controlled may cause total loss of a large portion of the crop.

The winter form may hibernate upon the plum or hop, and the destruction of the hibernating insects is very necessary if complete control is to be obtained.

Prompt action must be taken, and spraying conducted thoroughly, many failures where quassia is used being due to faulty preparation of the material.

To be effective, the chips must be soaked twenty-four hours, then boiled for two hours in three gallons of water. The decoction must be added to 247 gallons of water in which 9 lb. of soap has been dissolved (7 lb. of quassia are used in this formula).

Flour paste has been found by the writer to be just as effective as, and decidedly cheaper than, soap in conjunction with nicotine. The paste is made by mixing a cheap-grade flour with cold water until a smooth batter is obtained, then diluting until there is 1 lb. of flour to each gallon of the mixture, afterwards boiling until a paste is formed, stirring all the time to prevent burning.—V. G. J.

Horticultural Picket Line, The. By Frederick Maskew (*U.S.A. St. Com. Hort. Cal., Bull.* July 1913, vol. ii. No. 7, 6; figs.).—The author describes the measures used to prevent the entry of the Mexican orange maggot into California.—*V. G. J.*

Horticulture in Ohio (*U.S.A. Exp. Stn., Ohio, Circ.* 103; 1909).—In this report some results of apples blooming and setting are compared, and a discussion is reported on spraying against fungi, spray injury, and spraying against market-garden diseases and pests. In spraying against tomato-leaf spot, it was found that although disease was checked and crop increased, maturity was delayed, and the cost of spraying more than equalled the value of the extra crop.

Costs of spraying orchards, with valuable data as to apple-growing in Southern Ohio, are given.—*C. P. C.*

Hydrocyanic Acid Gas in Horticulture. By F. Pilkington Sargeant and F. C. Edwards (*Gard. Chron.* July 25, 1914, p. 65).—Records nature and history of this gas, its suitability for destruction of insect pests, principal causes of failure, directions for use in special cases, and ends with three useful lists of

- (a) Six typical fumigations, with results.
- (b) Plants uninjured by phosphoric-cyanide process.
- (c) Plants injured by same.—*E. A. B.*

Hydrocyanic Acid Gas, Influence of Various Light Intensities and Soil Moisture on Susceptibility of Cucumbers to Damage by. By G. E. Stone (*U.S.A. Exp. Stn., Mass., Ann. Rep.* 1912, p. 61, Jan. 1913).—The influence of varying degrees of light intensity and of soil moisture upon the development of cucumbers is described, and it was found that burning of foliage after fumigation with hydrocyanic acid was greatest in plants grown under poor light conditions, and that anything that causes the development of imperfectly matured tissue tends to the burning of the foliage.—*F. J. C.*

Hypericum Aseylon (*Bot. Mag.* tab. 8557).—North-Eastern America and Eastern Asia and Japan. *Nat. Ord.* Hypericaceae, *Tribe* Hypericeae. Herb, half-woody, 3-4 feet high. Leaves sessile, $2\frac{1}{4}$ inches long. Petals $1\frac{1}{2}$ inch long, 1 inch broad. Flower nearly 4 inches across, yellow. Stamens in five groups.—*G. H.*

Insect Pests and Plant Diseases, Control of (*U.S.A. Exp. Stn., Cornell, Bull.* 283, 1910).—A brief illustrated description of various well-known plant diseases and pests, with formulæ for remedies, and a general spray calendar.—*C. P. C.*

Insect Pests, Garden and Truck Crops. By C. E. Sanborn (*U.S.A. Exp. Stn., Oklahoma, Bull.* 100, Oct. 1912; 70 figs.).—This treatise covers all the more important insect pests of the market and garden crops of Oklahoma. General treatment for each species is given, with formulæ of sprays, poisoned baits, &c.—*V. G. J.*

Insect Pests of the Household. By R. D. Whitmarsh (*U.S.A. Exp. Stn., Ohio, Bull.* 253, December 1912; 1 pl., 45 figs.).—Detailed accounts are given of many domestic insect pests, the most important being the house or typhoid fly. This fly is known to carry the germs of typhoid, tuberculosis, cholera, and dysentery, and may possibly carry also smallpox, leprosy, plague, and other dangerous diseases. It is estimated that 95 per cent. of the house flies come from horse manure, and that one pound of this substance is capable of producing 1,200 flies.—*V. G. J.*

Irises of the Reticulata Group. By W. R. Dykes (*Gard. Chron.* Feb. 28, 1914, pp. 143-4; 3 figs.).—Points out distinctions in modes of increase which separate *histrion* and *histrionoides* from *reticulata* forms. Classification and geographical facts are chiefly dealt with.—*E. A. B.*

Irrigated Soils, Evaporation from. By Samuel Fortier and S. H. Beckett (*U.S.A. Dep. Agr., Bull.* 248, April 1912).—A discussion on the effects of surface and deep irrigation on the evaporation of water from the soils. The authors suggest that an irrigation depth of 6 to 9 inches will be found the most satisfactory, as giving the best crop results with the least loss.—*C. P. C.*

Irrigation, Water. By J. A. Widsøe and L. A. Merrill (*U.S.A. Exp. Stn., Ohio, Bull.* 115 to 120 inclusive, 1912). The authors have in the above bulletins thoroughly discussed the various phases of irrigation.—*C. P. C.*

Jonathan Spot Rot. By M. T. Cook and G. W. Martin (*Phytopathology*, iii. p. 119, April 1913).—The authors appear to consider this trouble of apples, characterized by dry, shallow masses of brown or black tissue around the lenticels, slightly sunken, and about 1 cm. in diam., to be produced by a species of *Alternaria*. 'Jonathan' seems to be the most usually affected, but 'Nero,' 'Smokehouse,' and 'Newtown Pippin' are also attacked. (See "Fruit Spot" above.)
F. J. C.

Kniphofia carinata (*Bot. Mag.* tab. 8545).—South Africa. Herb, perennial. Leaves $2\frac{1}{2}$ feet long, 1 inch wide. Scape, with raceme 6 inches long, dense-flowered. Perianth clear yellow.—*G. H.*

Lady Beetles of Connecticut, Some Common. By W. E. Britton (*U.S.A. Exp. Stn., Conn., Bull.* 181, Jan. 1914, Entom. Series 19; 24 figs.).—These beetles are of great benefit to plant-growers because they feed in both larval and adult stages on many noxious pests, especially aphides and scale insects.

Dr. A. S. Forbes examined the stomach contents of thirty-nine specimens, and found that though they ate some vegetable food, such as pollen and the spores of fungi, a greater portion of their food consisted of insects, principally aphides.—*V. G. F.*

Larch Case-bearer, The. By G. W. Herrick (*U.S.A. Exp. Stn., Cornell, Dep. Entom., Bull.* 322, Nov. 1912; 15 figs.).—The larch case-bearer (*Coleophora laricella* Hbn.) is a European insect. It is a serious pest to the forest larches in Germany, was introduced into Great Britain with the larch, and later on found its way to America, where it works considerable havoc among both European and American larches.

Lime-sulphur seems to be an effective remedy when applied as late as possible in the spring, before the buds start growing.—V. G. J.

Larkspurs, Analysis of some Wyoming. By S. K. Loy, F. W. Heyl, and F. E. Hepner (*U.S.A. Exp. Stn., Wyoming, Ann. Rep.*, 1912-13, pp. 73-79).—Considerable economic loss is caused in this State through poisonous plants, of which the larkspur genus ranks second in importance, the most poisonous species being *Delphinium elongatum* (glaucum), *D. Nelsonii*, and *D. Geyeri*. This paper gives the proximate analyses of the different parts of plants of these species. An intraperitoneal injection of .0564 gram of the alkaloid obtained from the leaves of *D. Geyeri* as sulphate killed a guinea pig weighing 675 grams in nine minutes.—A. P.

Lawn Soils and Lawns. By Oswald Schreiner, J. J. Skinner, and C. C. Corbett (*U.S.A. Dep. Agr., Bull.* 494).—An interesting treatise on the types of soil most suitable for the formation of lawns, large or small, with a table of the most satisfactory grasses.

In the second part the making and feeding of lawns are discussed, the authors suggesting very high feeding indeed at the beginning, 500 to 1000 lb. of well-slaked lime, the same quantity of bone flour, with 300 to 500 lb. compound fertilizer, also 40 to 60 loads well-rotted manure to the acre.—C. P. C.

Lebanon and Anti-Lebanon, Flora of. By Jas. Bornmüller (*Beih. Bot. Cent.* xxxi. Abt. 2, Heft 2, pp. 177-280; with 2 plates).—This paper is a complete enumeration of the plants found by the author in this district. There are critical notes on the many doubtful forms.

New species of *Sison*, *Achillea*, and *Hyoscyamus* are described, as well as many new varieties and combinations.

There is also a key to the varieties of *Koeleria phleoides*.—G. F. S. E.

Legumes, A hitherto unnoted benefit from the growth of. By T. L. Lyon and J. A. Bizzell (*U.S.A. Exp. Stn., Cornell, Bull.* 294, March 1911).—It is shown by the authors that the protein contents of non-legumes is greatly increased when grown together with legumes.—C. P. C.

Lemon Trees, Two Fungi as Causal Agents in Gummosis of, in California. By H. S. Fawcett (*U.S.A. St. Com. Hort., Cal., Bull.* ii. 8, August 1913; 17 figs.).—Lemon gummosis in at least two forms has been found to be readily transmissible from diseased to healthy trees by inoculation.

By series of many inoculations into healthy trees it has been found that the grey fungus (*Botrytis vulgaris*) is capable of inducing one form of gummosis, and that the brown-rot fungus (*Pythiacystis citrophthora*) is capable of inducing the other.

Concentrated Bordeaux mixture or Bordeaux paste (1 lb. of blue-stone, 2 lb. slaked lime to 1½ gallon of water) has given good results.

V. G. J.

Lillium Parryi. By A. Grove (*Gard. Chron.* March 28, 1914, p. 216; fig.).—Valuable hints for the preparation of suitable soil for this Lily.—E. A. B.

Lime-Sulphur Injury, Investigation of. By V. I. Safo (*U.S.A. Exp. Stn., Ohio, Research Bull.* 2, July 1913; figs.).—Of the various compounds found in lime-sulphur the polysulphides and to a less extent calcium thiosulphate appear to be the most likely to cause injury; none of the other normal ingredients occurring in the lime-sulphur, either before or after its application, were found to be harmful to fruit or foliage. Rain following spraying tends to decrease or prevent injury. The density of the spray does not appear to be an index of its power of causing leaf or fruit injury, nor can the density of the solution be taken as an indication of the concentration of its various constituents. Many cases reported as due to lime-sulphur injury are frequently the result of sun-burn. The experiments were carried out on the foliage of beans, potatoes, and fruit trees; none appear to have been carried out with such sensitive foliage as the gooseberry appears to have.—F. J. C.

Liver of Sulphur, Purchase and Use of (*Jour. Bd. Agr.* vol. xxi. No. 3, pp. 236-241).—Liver of sulphur, as sold commercially, is a mixture of several chemical compounds. Its value as a spraying material depends upon its content of such substances as have a fungicidal action, viz. sulphides (hydrosulphide, sulphide, and polysulphide). It was to be expected that the sulphide content would vary according to the method of preparation of the liver of sulphur by the manufacturers, and also according to the way in which the liver of sulphur was stored subsequent to manufacture, as other compounds might be expected to be formed on exposure to the air.

In order to investigate these points a series of analyses was made in the Government Laboratory. It was found in the case of some sixteen samples purchased in different places that the sulphide content varied from 19·83 per cent. to 37·94 per cent.

With a view to obtaining information as to the rate at which liver of sulphur undergoes decomposition on exposure to the air, ten samples were exposed in open bottles, their sulphide content being ascertained both before and after exposure. It was found that they rapidly lost their sulphides, fifteen days sufficing in one instance for a sample containing 28·56 per cent. sulphides to become useless. From the

experiments carried out it is clear, however, that storage for a prolonged period of from four to seven months produces practically no change in liver of sulphur provided the receptacle is air-tight and completely full. As fresh air is admitted each time a bottle or tin is opened, it would obviously be an advantage to horticulturists to pack and store liver of sulphur in bottles or lever-topped tins of small capacity, of say $\frac{1}{2}$ lb. to 1 lb.

A good sample of liver of sulphur should dissolve in water without separation of sulphur. If it does not smell of sulphuretted hydrogen, decomposition has proceeded so far that no "sulphide" sulphur remains. Further experiments were made to ascertain whether solutions of liver of sulphur could be kept without undergoing change, and it was inferred that solutions of liver of sulphur should be prepared just before use, or the solutions, if made beforehand, should be kept in full, tightly-corked bottles.—A. S.

Lonicera deflexicalyx (*Bot. Mag.* tab. 8536).—China and Tibet. *Nat. Ord.* Caprifoliaceae, *Tribe* Lonicereae. Shrub. Leaves lanceolate $1\frac{1}{2}$ –3 inches long. Peduncles very short, 2-flowered. Corolla yellow, tube $\frac{1}{2}$ inch long, with limb, $\frac{3}{4}$ inch. Berries orange-yellow.—G. H.

Lonicera Ledebourii (*Bot. Mag.* tab. 8555).—California. *Nat. Ord.* Caprifoliaceae, *Tribe* Lonicereae. Shrub, erect, branches up to 15 feet long. Leaves lanceolate, $3\frac{1}{2}$ inches long. Flowers geminate; corolla funnel-shaped, reddish-yellow outside, yellow within.—G. H.

Maize, Floral Abnormalities. By J. H. Kempton (*U.S.A. Agr. Dep., Bull.* 278, 1913; 16 pp.; 2 figs., 2 plates).—The frequent development of two-flowered female spikelets on the pistillate inflorescence of *Zea Mays* is evidence in favour of the relationship between *Zea* and the Andropogoneae. Neither *Euchlaena* nor *Tripsachum* has two-flowered female spikelets.—S. E. W.

Maize Hybrids. By G. N. Collins and J. H. Kemp (*U.S.A. Dep. Agr., Bull.* 120, 1913, pp. 21–27; 1 fig.).—A Chinese variety of maize has a waxy endosperm, which differentiates it from any kind of American maize. When the Chinese variety is crossed with sweet varieties, seeds are produced with horny endosperms.

Unlike the ordinary horny kind, the plants grown from the hybrid seed produced ears with horny, sweet, and waxy seeds. The horny seeds were heavier than the waxy, which were heavier than the sweet.

S. E. W.

Manganese in Plants, Function of. By W. P. Kelley (*Bot. Gaz.* lvii. pp. 213–227; March 1914).—The author grew a large number of plants in normal soil and also in soil containing manganese (Mn_2O_4). The ash was then analysed.

The proportion of manganese absorbed was (naturally) greater in

those plants grown in soils containing this salt, but there were remarkable differences in the proportions of the other minerals taken up.

In some cases the plants on manganiferous soil absorbed double the amount of lime, and only half that of the magnesia and phosphoric acid, taken by those which were grown in normal soils.

But there are in the tables given extraordinary variations. Out of twenty-six plants, in three cases *less* lime was absorbed, in ten more magnesia, and in two cases more phosphoric acid in the manganiferous soil.

The author infers that soluble manganese, when reaching the root-hairs, is absorbed and forms combinations with the protoplasm. Once these combinations are formed, the permeability of the protoplasm is altered, and this affects the relative absorption of lime and magnesia.

Hence, as the balance of lime and magnesia is affected, some plants may be assisted, others poisoned, and yet others may be quite unaffected.

Manganese may also act indirectly on plants by increasing oxidation in the soil. There is also a possibility that phosphoric acid might be precipitated in the soil as manganese phosphate, so hindering the absorption of phosphoric acid.—*G. F. S. E.*

Manganese on Pineapple Plants, Effect of. By E. V. Wilcox and W. P. Kelley (*U.S. Exp. Stn., Haw., Bull.* 28, September 1912).—Highly manganiferous soils cause the decay of roots, loss of chlorophyll, bad ripening, with a formation of lime oxalate in the soil in large quantities. The addition of soluble phosphates considerably modifies the bad effects, and the authors recommend the planting of old stumps instead of new suckers.—*C. P. C.*

Mango: The Basis of Classification. By F. W. Popinoe (*Am. Pom. Soc., Bull.* 7, p. 41).—The great confusion in the nomenclature of this fruit has led the author to propose a systematic description and a classification based first on the fact that mangos are both monoembryonic and polyembryonic. The subsequent divisions would be based on certain well-known geographical types, and a short bibliography is appended.—*E. A. Bd.*

Melanose and Stem-end Rot. By B. F. Floyd and H. E. Stevens (*U.S.A. Exp. Stn., Florida, Bull.* 111 ; 1913).—Experiments carried on by the authors of this bulletin have clearly shown that melanose and stem-end rot of citrus fruits are caused by one and the same fungus, *Phomopsis citri*. Melanose is only a superficial spotting of fruit and stems, whereas stem-end rot is a bad rot which occurs at the stem-end of the citrus fruits and progresses down into the fruit itself, making it valueless.

Phomopsis citri can live as a saprophyte on dead twigs, which form a dangerous source of infection to the surrounding branches. The pycnidia are black ; the spores, which are oval, are protruded from the pycnidia either as slimy masses or thread-like tendrils, and are

distributed by rain and dew. Fruit injured by scale insects is readily infected.

The authors recommend the following as control measures :

(i.) Spray with Bordeaux mixture just after the blossom has fallen, and a second time about 3-4 weeks later.

(ii.) Spray for scale. It has been observed that after spraying with a fungicide there is a marked increase of scale.

(iii.) Carefully prune away all sources of infection in the way of dead branches, and remove all culls and dead mummified fruits.

D. M. C.

Mazus reptans (*Bot. Mag.* tab. 8554).—Himalaya. *Nat. Ord.* Scrophulariaceae, *Tribe* Gratiroleae. Herb, perennial, tufted, 1-2 inches high, prostrate and rooting. Leaves opposite, 1 inch long. Racemes, 2-5 flowered, erect, 2 inches long. Corolla unequally 2-lipped, purplish blue, lower blotched with white, yellow, and red-purple.—G. H.

Mesembryanthemums, Tannin of. By Dr. O. Oberstein (*Beih. Bot. Cent.* xxxi. Abt. 1, Heft 3, pp. 388-393; with 2 plates).—The leaves of *Mesembryanthemum* often contain beautiful tannin cells, sometimes visible to the naked eye (Gerbstoff-idioblasts). The author tested the contents of these cells with various reagents and finds the characteristic tannin reaction.

The Hottentots in South Africa, in fact, used *M. coriarium* Burch. for tanning. The author discusses the possible uses of these cells (protection against insects or snails, as reserve material, or as a method of lighting the interior of the leaf) without coming to a definite conclusion.—G. F. S. E.

Musk-melons, Fertilizer Experiments with. By Jno. W. Lloyd (*U.S.A. Exp. Stn., Illinois, Bull.* 155, April 1912).—Twenty plots were treated with varying amounts of manure and compound fertilizers. In the results the highest yields were obtained by the addition of 2 to 3 tons manure, plus 640 lb. of compound fertilizer. Compound fertilizers alone decreased the crop considerably.—C. P. C.

Mutation and Hybridization, Independent Phenomena. By R. R. Gates (*Zeit. f. Induk. Abstam. u. Vererb.* Bd. ii. Heft 4, 1914, pp. 209-279; plates).—The author gives a long account of experiments carried out to ascertain the relation between hybridization and mutation, and concludes that the two phenomena are independent. Many have expressed the opinion that de Vries' mutations were nothing but the splitting of hybrid characters, but according to the author's view, based on the results of a long series of experiments, this explanation of the phenomena is not tenable.—F. J. C.

Narcissus Flies (*Jour. Bd. Agr.* vol. xxi. No. 2, pp. 136-141; plate).—The large Narcissus Fly, *Merodon equestris* F., and the Small

Narcissus Fly, *Eumerus strigatus* Fln., are both fully described. Their life-histories and habits are dealt with, and methods of treatment are suggested.—A. S.

New Plants from Western America. By Aven Nelson and T. Francis Macbride (*Bot. Gaz.* Dec. 1913, pp. 469-479).—New species of *Allium*, *Calochortus*, *Arabis*, *Lepidium*, *Chaenactis*, *Tonestus*, and *Balsamorhiza* (two spp.) are described.—G. F. S. E.

Nitrates in Soils, Some relations of certain higher plants to the Formation of. By T. Lyttleton Lyon and James A. Bizzell (*U.S.A. Exp. Stn., Cornell, Memoir I.*, July 1913, pp. 1-112; 27 figs.).—This memoir, after reviewing previous work on this subject, describes a series of important experiments with various grasses and cereals, potatoes, and soy beans on specially prepared plots. The following is a summary of these results:

The nitrate content of soil under timothy, maize, oats, potatoes, millet, and soy beans was different for each crop, when on the same soil. There is a characteristic relationship between the crop and the nitrate content at different stages of growth. During the active growing period of the maize crop, nitrates were often higher under maize than in cultivated soil bearing no crop.

Under both maize and oats the nitrate content was higher during the period when the crop was making its greatest draft on the soil nitrogen than in the later stages of growth, in spite of the fact that the nitrates in the uncropped soil were increasing, while those in the cropped soil were disappearing. Changes in the moisture content or the temperature of the soil, after early summer, had no important effect on the nitrate content of the soil under plants.

Soil bearing alfalfa (lucerne) nitrified more rapidly than soil bearing timothy.

It is probable that the character of the organic matter left in the soil by the plants determines, to some extent, the rate of nitrate formation in this soil.

Maize was the only crop following which the nitrates were higher than in unplanted soil. Potato soil was the next highest in nitrates, and oat soil contained least nitrates.—A. B.

Nitrogen Fixation. By I. G. McBeth (*U.S.A. Dep. Agr., Bull.* 131, 1913, pp. 27-33).—The nitrogen-fixing power of *Azotobacter chroococcum* and *A. Beijerinckii* is stimulated by the presence of minute quantities of ammonium sulphate. In solutions containing both dextrose and cellulose, mixed cultures of *A. chroococcum* and *Bacillus rossicus* were more efficient than *Azotobacter* alone, if the solution contained a considerable quantity of initial nitrogen, and a destruction of the cellulose occurred.—S. E. W.

Nola gracillis (*Bot. Mag.* tab. 8541).—Asia Minor and Balkan Peninsula. *Nat. Ord.* Violaceae, *Tribe* Violeae. Herb, $\frac{3}{4}$ -1 $\frac{1}{2}$ inch high. Leaves $\frac{3}{4}$ inch long, ovate oblong, with tapering base. Corolla violet, limb 1 $\frac{1}{2}$ inch long and 1 inch wide.—G. H.

Oak, Polyporus dryadeus, A Root Parasite of. By W. H. Long (*Jour. Agr. Research*, i. pp. 239-250, Dec. 1913; plates).—This fungus (which is not the *P. dryadeus* of Hartig, which is, according to the author, *P. dryophilus*) is a root parasite of the oak, producing a white sap rot and a heart rot in the roots. In all cases examined there was no extension of the rot into the trunk, only the underground parts being affected. Trees growing under unfavourable conditions appeared most susceptible to the disease, which does not appear to spread readily from tree to tree. The disease is widely spread in America and in Europe, and attacks several species of oak.—F. J. C.

Oak, Three Undescribed Heart-Rots of Hardwood Trees. By W. H. Long (*Jour. Agr. Research*, i. pp. 109-128, Nov. 1913; plates).—A review of various forms of heart-rot is followed by a discussion of a "piped" or "pocketed" rot in various species of *Quercus* and *Castanea* brought about by *Polyporus Pilotae*, a "string and ray" rot of oaks due to *P. Berkleyi*, and a straw-coloured rot caused by *P. frondosus*.—F. J. C.

Olearia semidentata (*Bot. Mag.* tab. 8550).—Chatham Islands. *Nat. Ord.* Compositae, *Tribe*, Asteroideae. Shrub, 4 feet high. Leaves many, $1\frac{1}{2}$ – $2\frac{1}{4}$ inches long. Heads, terminal, 2 – $2\frac{1}{4}$ inches across. Ray-florets 50 and disk florets purple.—G. H.

Orange, Black Rot of. By Edw. O. Amundsen (*U.S.A. St. Com. Hort., Cal., Bull.*, May 1913, vol. ii. No. 5; 8 figs.).—Compared with other diseases of the citrus fruits and trees, this is not of much economic importance, but there is always the possibility that the percentage of infection may run high under favourable conditions for the dissemination and propagation of the disease-producing spores. *Alternaria citri* Pierce and Ellis is the fungus which causes the black rot. It will propagate on many kinds of vegetable matter, and the conidia are disseminated to the blossoms or fruit in the spring or early summer. The fungus is primarily a saprophyte, but becomes a parasite if introduced into the fruit.

As it is difficult to apply a fungicide, infection must be prevented by destroying all decaying vegetable matter in or near the orange groves.

Other subjects dealt with in this bulletin include "Sweet Potato Weevil," "Date Palm Scales and their Control," and "Fungus Gardens Cultivated by Ants."—V. G. J.

Pæonies (*U.S.A. Dep. Agr., Bull.* 527, 1913, pp. 5-7; 1 fig.).—The American Pæony Society recommends for cut flowers the following:

White.—Festiva Maxima, Couronne d'Or, Duchesse de Nemours, Baroness Schroeder, Albâtre, Alba Sulfurea, Mme. Crousse, Mme. Calot, Mme. de Vernéville, Boule de Neige, Avalanche, and Duc de Wellington.

Pale Pink.—Achille, Albert Crousse, Dorchester, Floral Treasure, La Perle, Mme. Lemoine, Marguerite, Gérard, Marie d'Hour, Miss Salway, Mademoiselle Léonie Calot, Mme. Emile Gallé, and Venus.

Pink and White.—Gloire de Charles Gombault, La Tulipe, and Jeanne d'Arc.

Deep Pink.—Mme. Ducel, Lamartine, M. Jules Elie, Livingstone, M. Bourcharlat aîné, Souvenir de l'Exposition Universelle, Mme. Lebon, General Bertrand, Modeste Guérin, Edulis Superba, Alexandre Dumas, Mme. M. Muysart, and Kelway's Queen.

Red.—Félix Crousse, Louis Van Houtte, and Henry Demay.

Deep Red.—Delachei, Prince de Talindyke, Constant Devred, Nigricans, Mme. Becquet, Pierre Dessert, and Rubra Superba.

For Landscape or Border Planting :

White.—Octavie Demay, Marie Jacquin, Baroness Schroeder, Albâtre, Duchesse de Nemours, Alice de Julvécourt, Mme. de Vernéville, Festiva, Marie Lemoine, Couronne d'Or, Mme. Bréon, La Rosière, Albiflora the Bride, Avalanche, and Festiva Maxima.

Pale Pink.—Achille, Eugène Verdier, Eugénie Verdier, Dorchester, Floral Treasure, Marie Crousse, Marie d'Hour, Triomphe de l'Exposition de Lille, Venus, La Perle, and James Kelway.

Pink and White.—Embellata Rosea, Golden Harvest, Mme. Costé, Mme. de Vatry, Thérèse, Princess Beatrice, Beauté Française, and Philomèle.

Deep Pink.—Mme. Ducel, Livingstone, M. Bourcharlat aîné, Souvenir de l'Exposition Universelle, Mme. Lebon, Général Bertrand, Modeste Guérin, Edulis Superba, Mme. Muysart, Alexandre Dumas, and Modèle de Perfection.

Red.—Fulgida, Félix Crousse, Augustin d'Hour, Louis Van Houtte, De Candolle, Henry Demay, and Dr. Caillot.

Deep Red.—Delachei, M. Martin Cahusac, Stanley, Raphael, Mme. Becquet, and Adolphe Rousseau.—S. E. W.

Papaya, Grafted. By D. Fairchild and E. Simmonds (*U.S.A. Dep Agr., Bull.* 119, 1913, pp. 3-13; 4 figs.).—It is a mistake to grow the Papaya from seed; it should be grafted and treated as an annual. To obtain shoots for grafting, decapitate a tree in fruit. Three or four weeks later a large number of shoots are produced. When a few inches long and the diameter of a lead pencil, each is cut to a wedge point and inserted in a cleft in a young seedling papaya plant which has been cut down to six inches and split with a sharp knife. The stock is tied with soft twine and shaded for a few days. On the seventh day the twine is removed.

In Florida plants grafted in spring come into bearing in November or December and continue bearing in the following spring or summer, and can be left to bear fruit in the following autumn. The Papaya is a gross feeder, but is indifferent to soil.—S. E. W.

Peach 'Arp Beauty.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—The earliest yellow peach of good quality. A clingstone variety, but considered promising for market growth.

E. A. Bd.

Peach, Brown-rot Canker. By R. A. Jehle (*Phytopathology*, iii. p. 106, Apr. 1913; plate).—Canker wounds in peaches were found to be due to *Sclerotinia cinerea*, and successful infection experiments were carried out. Self-boiled lime-sulphur (8–8–50), atomic sulphur (5–50), and sulphur in suspension (5–50) were all found to reduce the infection of the fruit to a very considerable extent. The stem cankers were cut out, the diseased cambium and bark being completely removed, the wound disinfected with corrosive sublimate (1–1000), and coated with gas tar, with the result that they healed well.—*F. J. C.*

Peach 'Frances.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A variety raised in Texas, which is considered likely to fill a gap in the season of American varieties.—*E. A. Bd.*

Peach 'Miss Lola.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—This is described as the best of its season. Extremely hardy and productive.—*E. A. Bd.*

Pear 'Lucy Duke.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A supposed hybrid between 'Williams' and 'Winter Nélis.' Was considered by Charles Downing to be not far behind 'Seckel' in the matter of flavour. Tree characters much resemble 'Winter Nélis.'—*E. A. Bd.*

Pecans, Some Diseases of. By F. V. Rand (*Jour. Agr. Research*, i. pp. 303–338; Jan. 1914; fig.).—Pecan cultivation has recently spread to a very considerable extent in the States, and it has become necessary to study in some detail the insect and fungus pests to which it is liable. The diseases dealt with do not include "scab," which is a very serious trouble, but "nursery-blight," due to *Phyllosticta caryae* Peck, is fully described. Only young trees appear to be attacked, and the foliage of these is frequently so peppered with the grey spots produced by the fungus that the growth of the tree is seriously impaired. Brown leaf-spot due to *Cercospora fusca* is less serious, and may be controlled by three sprayings with Bordeaux mixture. Reddish-brown spots are produced on the leaves, which, as in the case of nursery-blight, are the only parts of the plant attacked. Anthracnose due to *Glomerella cingulata* (Stonem.) S. and v.S., produces leaf-blotch or "rust" on leaves and nuts. This fungus is better known as *Gloeosporium fructigenum* and produces bitter rot in apples and grapes, and "anthracnose" in a great number of hosts. "Kernel-spot" is characterized by dark brown or almost black, sunken spots on the kernels, invisible until the latter are freed from the shell. It is found to be due to *Coniothyrium caryogenum* sp. n. Crown-galls due to *Bacillus tumefaciens* were found on a few young trees, and the organism was isolated from the tissues. Some excellent figures illustrate the paper.—*F. J. C.*

Pecan, The. By W. N. Hutt (*Am. Pom. Soc., Bull.* 7, p. 122).—A study of the pecan from the horticultural point of view. The grafting or budding of good types is advised, as seedlings are subject to considerable variation. There are now some hundred named varieties of pecan grown in the Southern States.—*E. A. Bd.*

Persimmon, The ; Native American Varieties. By W. F. Fletcher (*Am. Pom. Soc., Bull.* 7, p. 48).—A short account of the native persimmon, its distribution, description, horticultural value, and cooking recipes.—*E. A. Bd.*

Phosphorus, Changes and Availability in Fermenting Mixtures. By W. Fottingham and C. Hoffmann (*U.S.A. Exp. Stn., Wisconsin, Bull.* 29, May 1913).—The addition of rock phosphate to fermenting manure was somewhat advantageous, while that of acid soluble phosphate proved to be the reverse.—*C. P. C.*

Pinus radiata, Proliferation in. By Francis E. Lloyd (*Bot. Gaz.* April 1914, pp. 314-319; pl. and 2 figs.).—A description of a peculiar form of this pine, in which the spur shoots proliferate. It was probably brought about by abundance of water. One tree was almost without whorls of branches, but nearly the whole of the main stem was densely clothed with foliage, due to the proliferation of almost every fascicle and giving a foxtail effect.—*G. F. S. E.*

Pithecoctenium cynanchoides (*Bot. Mag.* tab. 8556).—Brazil to the Argentine. *Nat. Ord.* Bignoniaceae, *Tribe* Bignoneae. Shrub, climbing. Leaves opposite, 3-foliate, terminal replaced by a tendril. Corolla white, yellow within, 2 inches long, curved.—*G. H.*

Plant Diseases. By G. P. Clinton, Sc.D. (*U.S.A. Exp. Stn., Conn., Rep.* 1911-12).—The first part of this report comprises Notes on Plant Diseases in Connecticut, the second part is devoted to Chestnut Bark Disease.

Chestnut Bark Disease was first noticed in America in 1904 and in 1906. Murrill ascribed it to a new fungus named *Diaporthe parasitica*. Both conidial and ascus stages have been observed, but the writer considers it comes more properly under the genus *Endothia*, and has named it *Endothia gyrosa* var. *parasitica*. It has two closely allied saprophytic or semi-parasitic forms, *Endothia radicalis* and *E. gyrosa*. The blight suddenly appeared in America after the unusually severe winter of 1903-1904, which injured trees in general in the North-Eastern United States. These conditions unfavourable to the host, followed by subsequent unusual summer droughts, the writer considers may have caused a native fungus (which he maintains the fungus to be) to assume unusual virulence and widespread prominence. He therefore suggests that it may be useless to try to make a strenuous fight against the fungus, since it will, under conditions favourable to the host, return in time to its former inconspicuous parasitism

The writer gives a good bibliography.—*D. M. C.*

Plant Growth, The action of certain nutrient and non-nutrient Bases on. By M. M. McCool (*U.S.A. Exp. Stn., Cornell, Memoir* 2, August 1913, pp. 113-216; 15 figs.).—This memoir is divided into three parts. Part I. deals with the antitoxic action of certain bases on plant growth; Part II. deals with the toxicity of manganese and the antidotal relations between this and other cations with respect to green plants; Part III. deals with the toxicity of various cations.

PART I. The plants used were Canada field peas and wheat. The chief conclusions derived from the experiments were as follows: Each of these substances, in the order given, is poisonous to seedlings: barium, strontium, ammonia, magnesium, sodium, potassium. Although mutual antagonism results when cations are present together in solution as follows: Mg and Sr; K and Sr; Na and Sr, Na and K; Na and NH_4 ; K and Ba; Mg and Ba; yet Calcium is most effective in preventing toxic action.

Protective action is not confined to the so-called essential nutrients. Na, Sr, Ba possess this property also.

The favourable results due to application of lime to soils is due to antidotal relations.

PART II. Similar plants were used. The general conclusions were as under: Pure solutions of manganese salts are extremely poisonous to seedlings. Toxicity is reduced by full nutrient solutions or in soil cultures. The injurious action of Mn ion is shown in the upper parts of the plants. Chlorosis of leaves is the first indication.

Manganese is less injurious to plants grown in the dark than to those grown in light.

Ca, K, Na, Mg ions counteract the poisonous action of Mn. Mutual antagonism exists between Mn and K; Mn and Na; Mn and Mg.

PART III. Ba, Sr, NH_4 , Mg, Na, K (in order given) in pure solutions are very toxic to seedlings. This toxicity is reduced in full nutrient solutions or soil cultures.

Seedlings grown for ten days in distilled water, in tap water, or in full nutrient solutions are far more resistant to any toxicant than those immediately placed in toxic solutions.

To each part there is appended a short bibliography.—A. B.

Plum 'Imperial Epicure.' By V. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A chance seedling found in 1870 in the Valley of the Lot. Brought to the United States in 1883 and first sold as 'Clairac Mammoth.' A promising market variety.

E. A. Bd.

Plum 'Middleburgh.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A chance seedling found in the State of New York some years ago. Considered to be one of the best in cultivation.—E. A. Bd.

Plum 'Pearl.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—A seedling of Burbank's, of remarkably good flavour.—*E. A. Bd.*

Plum 'Tennant.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364; plate).—One of the most attractive grown at the Experimental Station at Geneva. Raised by the Rev. John Tennant, Ferndale, Washington, and introduced to commerce in 1893.—*E. A. Bd.*

Poisoning of Cattle in the Pasture, The. By C. K. Francis (*U.S.A. Exp. Stn., Oklahoma, Ann. Rep.* 1912-13, pp. 20-29).—Some plants are poisonous only in the spring or early summer, and there is no doubt that at this season of the year they, as well as the generally recognized poisonous plants, cause the death of many farm animals. Investigations show hydrocyanic (prussic) acid to be present, though not in the free or uncombined state, at every stage of the growth of Kafir corn except the mature plant. It appears that stunted plants showing the need of rain are especially dangerous. All young growth of the sorghum group is liable to contain the poison. The second growth of frosted plants has also been shown to be unsafe. The samples containing the larger amounts of hydrocyanic acid were very bitter to the taste.—*A. P.*

Polyporus Berkleyi. By J. R. Weir (*Phytopathology*, iii. p. 101, Apr. 1913; plate).—This fungus attacks roots of *Larix occidentalis* which have been damaged by some other agent previously.—*F. J. C.*

Poplars, The Black. By Aug. Henry (*Gard. Chron.* July 4 and 25, 1914, pp. 1-2, 46-47, 66-67; 9 figs.).—Deals with the sports and hybrids of the Black Poplars of Europe and America. The European *P. nigra* differs from the American *P. deltoides* in absence of cilia on margin and glands on base of leaves. Both species have varieties pubescent and glabrous. *P. nigra* var. *typica* is glabrous; rarely seen in this country; native of S. and S.E. Europe.

P. nigra var. *betulifolia*, with pubescent twigs, is wild in both sexes in England and France.

P. nigra var. *italica* is the Lombardy Poplar, a sport of *P. nigra* var. *typica*, widely propagated and planted, and a staminate form. Female Lombardy Poplars are hybrids, the pollen parent being this tree. *P. plantierensis* is the fastigate form of *P. nigra* var. *betulifolia*.

P. deltoides Marshall is retained as the name of the American species. Var. *monilifera* is only represented in England by a tree in Cambridge Botanic Gardens. Var. *occidentalis* is a xerophytic form, but it and var. *missouriensis* have not been introduced to Europe.

P. angulata, the Carolina Poplar, cultivated in France and England since 1730, differs only in the scales of the flowers, and may be a

mutation after cultivation. Hybrids show such vigour among seedlings that they are much cultivated. Among them are :

P. serotina ♂ with ascending branches and a wide head.

P. regenerata ♀, an early-leaving form.

P. Eugenei × *Henryana*, both ♂.

P. marilandica ♀, not very vigorous.

P. robusta, perhaps the best of the hybrids, and *P. Lloydii* are seedlings of *P. nigra* var. *betulifolia*.—E. A. B.

Potato Culture. By A. Dickens (*U.S.A. Exp. Stn., Kansas, Bull.* 194, pp. 473-491; 4 figs.).—To avoid scab, soak the seed potato for two hours in 30 gallons of water to which one pint of 40 per cent. formalin is added; dry, cut, and plant. Spray the plants when they are six inches high with Bordeaux mixture to prevent fungoid diseases, and with lead arseniate to destroy insect pests.

S. E. W.

Potato Scab, Experiments relating to the Control of. By G. E. Stone and G. H. Chapman (*U.S.A. Exp. Stn., Mass., Ann. Rep.* 1912, p. 84, Jan. 1913).—The experiments referred to in this paper deal with the scab produced by the fungus *Oospora scabies*. Experience has shown that the presence of carbonates in the soil will increase the amount of scab very considerably, and where these are present the use of formalin, &c., for sterilizing the tubers is of little avail. A series of experiments with various chemicals, including sulphur, naphthalene, formalin, carbon-bisulphide, and nicotine, as well as with a substance called by-product A, were carried out, and with those in steam-sterilized soil gave somewhat inconclusive results. The experiments are to be continued.—F. J. C.

Potato, Spraying (*U.S.A. Dep. Agr., Bull.* 527, 1913).—Spraying the potato with Bordeaux mixture prevents loss from blight, protects the plants from insects, and stimulates the growth and increases the yield.—S. E. W.

Potato-Tuber Moth, The. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Farm. Bull.* 557, Oct. 1913; 4 figs.).—For many years this moth (*Phthorimoea operculella* Zell.) has been the worst potato pest in California. It has now reached Washington and Southern Texas, and menaces adjacent States. It feeds also on the tomato, egg plant, and tobacco; when it occurs on tobacco it is known as the split worm. The larvæ bore between the surfaces of the leaves or into the potato skin, which they mine in every direction, finally devouring the exterior. There are probably several generations, and certainly another can be produced in store. Therefore this insect belongs to both truck crop and stored product pests.

Clean cultivation and the extermination of all solanaceous weeds, crop rotation, and turning loose hogs and sheep over infested ground are among the remedies suggested; also fumigation with hydrocyanic gas and carbon bisulphide.—V. G. J.

Potato Weevils, New, from Andean South America. By W. D. Pierce (*Jour. Agr. Research*, i. p. 347-352, Jan. 1914; figs.).—Weevils have been found in potatoes showing no external signs of their presence, and as a result the Federal Horticultural Board of the United States has excluded South American potatoes from the United States. In 1913 the weevil *Rhigopsidius tucumanus* Heller was found in potatoes from Peru, Bolivia, and Chile, and the author now describes and figures two other new species which similarly burrow in the flesh of the potato. They are each representatives of a new genus, viz. *Premnotrypes solani* and *Trypopermnon latithorax*. The work of the three weevils is very similar, but the first is more common than the other two.

F. J. C.

Potatoes, Black Heart of. By E. I. Bartholomew (*Phytopathology*, iii. p. 180, June 1913; figs.).—Tubers affected by this disease show a blackening of the tissues, especially in the central regions. The appearance apparently developed during somewhat peculiar conditions of transit, and the author found it not difficult to reproduce the blackening by exposing tubers in a drying oven for from eighteen to forty-eight hours to a temperature of 38° to 45° C. Chilling did not produce it, nor was it evident that excess of either oxygen or carbon dioxide influenced the changes. The change is not evident from outside, and if the tubers be allowed to remain for some time the blackened tissues of the centre shrink, leaving a hollow with a black lining. The appearance is entirely different from that associated with sprain.

F. J. C.

Potatoes, Late Blight and Rot of. By M. F. Barrus (*U.S.A. Exp. Stn., Cornell, Circ.* 19; 1913).—The symptoms of *Phytophthora infestans* attack are described, and spraying with Bordeaux mixture 5-5-50 recommended. Lime sulphur spray causes marked dwarfing in potato plants, and should not be used.—D. M. C.

Potatoes, Osmotic Pressure in. By M. A. Brannon (*Bot. Gaz.* Nov. 1913, pp. 433-438; four figs.).—The osmotic pressure of sap from potatoes kept in an ice-box continually increased from October 11 to January 23, and reached fourteen atmospheres on July 17. In those kept at ordinary temperatures the pressure decreased until April 7. Unfiltered sap showed higher pressure than filtered, and in larger potatoes of the same variety it was greater than in small ones. The ice-box potatoes showed more pronounced acidity. This acidity is most marked near the "eye" and disappears in the cortex as the distance from the "eye" increases. The author concludes that starch and hemicellulose are hydrolyzed by enzymes which are released through the acidity. They furnish the necessary energy for metabolism during cold storage.—G. F. S. E.

Potatoes, Wart Disease of (*Journ. Bd. Agr.* vol. xxi. No. 2, pp. 135-136).—The note referred to is a communication which the

Board have received from Professor Jakob Eriksson, of Stockholm, relating to an experiment which he conducted during 1913, in order to test the efficacy of formalin in killing the contagious matter in soil infected with wart disease of potatoes. From this experiment it is concluded that "a dilute solution of formalin, 1 in 100, is capable of killing the infective matter in soil contaminated with this disease. In very badly infected soil it would be better to make trials also with 2 and 3 per cent. solutions. If the remedy is really as good as it seems it will be possible to eradicate the disease in all gardens where it is now destructive."—A. S.

Primula angustidens, Pax, Not a Species. By Prof. Bayley Balfour (*Gard. Chron.* Aug. 22, 1914, p. 143).—The name covers three types in Pax's Monograph, which the author divides into three:

1. *P. japonica* var. *angustidens*, not in cultivation.
2. *P. Wilsonii* Dunn. Plant aromatic. Corolla limb concave.
3. *P. oblanceolata* Balf. fil. Not aromatic. Corolla limb flat. Leaves long, narrow, flat; corolla tube white. This can be recognized from *P. Poissonii*, in which the leaves are short, broad, crisped; corolla tube red.—E. A. B.

Primula Purdomii (*Bot. Mag.* tab. 8535).—West Kansu. *Nat. Ord.* Primulaceae, *Tribe* Primuleae. Herb, acaulescent. Leaves, $4\frac{1}{2}$ inches long, tapering at the base. Scape 5 inches. Umbel 8-flowered. Corolla lavender, with limb 1 inch diameter.—G. H.

Pruning Wood in Trees, Dressings for. By A. D. Selby (*U.S.A. Exp. Stn., Ohio, Bull.* 126).—The writer recommends an antiseptic such as carbolic acid to be used first, followed by an application of asphaltum dissolved in $1\frac{3}{4}$ to 2 parts of linseed oil by weight for large wounds. The dressing to be kept in closed tins and applied as required.—C. P. C.

Prunus, The Pubescent-fruited Species of, of the South-Western States. By S. C. Mason (*Jour. Agr. Research*, i. pp. 147–178, Nov. 1913; plates).—The relationship of the wild plums described in this paper is closer to the plums of Asia than to the wild plums of the rest of the States. A description of the habitat and environment under which they grow in California, &c., is followed by a classification and notes, with figures of all the species. *Prunus texana* and its hybrids ('Ramsey,' 'Llano,' 'Willow,' 'Sumlin,' 'Holmann,' 'Gephart,' 'Johnson,' 'Bolen,' 'Stuart,' 'Hildebrand,' 'Whittaker'), *P. Andersonii*, *P. eriogyna*, *P. microphylla*, and *P. Harvardii* are described.

F. J. C.

Quercus Prinus, Twig Blight of. By D. E. Ingram (*Jour. Agr. Research*, i. pp. 339–346, Jan. 1914; figs.).—*Diplodia longispora* C. and Ell., was found to cause the dying back of shoots of this oak and of some allied species; but no practical means of dealing with it, beyond the cutting back of affected shoots, is suggested.—F. J. C.

Raspberry 'June.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364; plate).—A seedling from 'Marlborough' with increased vigour. The earliest of seventy varieties tested.—*E. A. Bd.*

Raspberry 'Plum Farmer.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 364).—The best black raspberry tested at the Experimental Station at Geneva. The fruit is large, of high quality, and travels well.—*E. A. Bd.*

Red Spider on Cotton, The. By E. A. McGregor (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 172, May 1913; 12 figs.).—Red spider (*Tetranychus bimaculatus* Harvey) is becoming one of the serious enemies of the cotton plant in the United States. It is prevalent throughout the cotton belt; seasons of excessive drought are favourable to its development, and at such times the pest increases so rapidly that the damage done by it is often severe before its presence is noticed.

When the cotton dies in the late fall an exodus of red spiders occurs in the effort to find suitable food plants for the winter. Prominent among the plants favoured by the mite is the cultivated English violet.

Recommended measures of control are (1) clean culture; (2) control of violets by destroying or spraying plants growing near cotton fields; (3) choosing spider-resisting varieties of cotton.

The following formulæ for spraying are given in the bulletin:—

(1) Stock solution of flour paste. Mix cheap wheat flour with cold water at the rate of 1 lb. of flour to 1 gallon of water. Boil to a paste.

(2) Flour paste spray. Use 8 gallons of the above stock solution paste to each 100 gallons of water. Keep constantly agitated while spraying.

(3) Lime-sulphur and flour paste mixture. Use 4 gallons of flour paste stock solution to each 100 gallons of lime-sulphur spray.—*V. G. J.*

Red Spider on Hops in the Sacramento Valley of California, The. By W. B. Parker, M.S. (*U.S.A. Dep. Agr., Entom. Bur., Bull.* 117, May 1913; 6 pls., 9 figs.).—Great financial loss may be caused by red spider on hops. The mites are not affected by any form of dry sulphur, but are easily killed by several contact insecticides, the cheapest and most convenient being flour paste or a combination of flour paste and lime-sulphur. The infested area must be thoroughly and rapidly covered, and must be sprayed a second time seven or ten days later.—*V. G. J.*

Respiration of Plants under Various Electrical Conditions. By R. C. Knight and J. H. Priestley (*Ann. Bot.* xxviii. p. 135, Jan. 1914).—The authors show that respiration in pea seeds is unaffected by electrical discharge, any increase in CO₂ production being accounted for by increase in temperature due to the discharge.—*F. J. C.*

Rhubarb, Cultivation of, for Medicinal Purposes. By E. M. Holmes (*Gard. Chron.* May 16, 1914, p. 327).—Success depends on well-drained but not dry soil, and presence of lime.

Rheum Rhaponticum, *R. palmatum* var. *langhuticum*, and *R. officinale* are those grown in England. The produce of *R. officinale* is said to be as efficacious as that of the Chinese root.—E. A. B.

Ribes laurifolium (*Bot. Mag.* tab. 8543).—Western China. *Nat. Ord.* Saxifragaceae, *Tribe* Ribesieae. Shrub, 5–6 feet high. Leaves, short, $2\frac{1}{4}$ –4 inches long. Racemes pendulous, $1\frac{1}{2}$ inch long, up to 12-flowered. Flowers greenish petals $\frac{1}{5}$ inch long, spatulate. Fruit wide-elliptic, reddish, $\frac{3}{8}$ inch long.—G. H.

Rice, Assimilation of Nitrogen by. By W. P. Kelley (*U.S.A. Exp. Stn., Haw., Bull.* 24, June 1911).—The author discusses various fertilizers for rice, and recommends the use of sulphate of ammonia, as it was found that the various nitrates caused an increase of injurious compounds in rice soils.—C. P. C.

Rondeletia cordata (*Bot. Mag.* tab. 8540).—Guatemala. *Nat. Ord.* Rubiaceae, *Tribe* Condamineae. Shrub, 4–6 feet high. Leaves ovate or elliptic-ovate, $2\frac{1}{2}$ –7 inches long. Cymes terminal, many-flowered, $4\frac{1}{2}$ inches wide. Flowers, with reddish-purple corolla-tube and rose-coloured lobes, $\frac{1}{2}$ inch across.—G. H.

Root Crops, Fertilizer and Seeding Experiments with. By C. F. Clark and E. R. Minns (*U.S.A. Exp. Stn., Cornell, Bull.* 267, May 1909).—The authors recommend on a clay loam soil 12 lb. seed to the acre, hand drilled. They do not advise saving own seed. In the fertilizer experiments, nitrate of soda with soluble acid phosphate, given in the proportion of 120 lb. nitrate of soda, 240 lb. acid phosphate, gave best results.—C. P. C.

Rose Slug-Caterpillar, The. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 124, Oct. 1913; 1 fig.).—This caterpillar feeds on rose, oak, plum, dogwood, apple and pear, but does not appear to do very considerable damage. It is the larva of a moth (*Euclea indeterminata*) and undergoes eight or nine distinct stages before transforming to pupa. In stage 1, which is passed rapidly, it takes no food. The species hibernates in its cocoon, and the moth has generally been observed to issue in July.—V. G. J.

Salvia uliginosa (*Bot. Mag.* tab. 8544).—Eastern South America. *Nat. Ord.* Labiatae, *Tribe* Monardeae. Herb, 8 feet high. Leaves oblong-lanceolate, $3\frac{1}{2}$ inches long. Inflorescence terminal. Verticillasters 7–20 flowered. Corolla, blue lip, 3-lobed, $\frac{1}{2}$ inch long.—G. H.

Scale Insects of Mississippi, Some. By Glenn W. Herrick (*U.S.A. Exp. Stn., Miss., Tech. Bull.* 2, Feb. 1911; 23 plates).—Scale insects occur on all kinds of plants, both cultivated and wild,

and they are easily carried from one country to another on their host plants. This bulletin contains a description of many species and some very remarkable drawings.—V. G. J.

Seed, Germination of, as affected by Sulphuric Acid Treatment. By H. H. Love and C. Leighty (*U.S.A. Exp. Stn., Cornell, Bull.* 312, March 1912).—In this bulletin the value of concentrated sulphuric acid sp.g. 1.84, for immersing hard seed to assist germination, is discussed.

The treatment varied with an immersion of 30 to 180 minutes, and the germination was increased up to 50 per cent.

Certain weed seeds were destroyed by the process, as were some of the fungoid diseases.—C. P. C.

Shading of Tobacco Plants, Effect of. By Heinrich Hasselbring (*Bot. Gaz.* April 1914, pp. 257-286; 1 fig.).—The author's experiments were intended to show the effect of cheese-cloth shading on the transpiration and assimilation of the tobacco plant in Western Cuba.

He found that the total light was about one-third less in the shade on *bright* days, but there was very little difference in diffuse light (Wynne exposure-meter). The cheese-cloth tents show a very slight tendency to retain heat. The relative humidity is higher inside the tents, especially towards the end of the season, and the rate of evaporation is constantly less. There is also a reduction of air current.

Transpiration is therefore diminished. The author found that it was 30 per cent. greater in the open or sun plants, and per unit area of leaf surface nearly twice as great when compared with shaded plants.

The total plant substance is not diminished, but the leaves of the shaded plants have a much greater total area than those of plants grown in the open.

Relatively less material is deposited in the leaves and more in the stems of the shade plants.

Cheese-cloth shading in Cuba, where tobacco is grown by irrigation, results in a saving of water and a reduction of the loss of water from the soil.—G. F. S. E.

Sixteenth-Century Gardens in Germany. By K. Wein (*Beih. Bot. Cent.* xxxi. Abt. 2, Heft 3, pp. 463-555).—The author gives a long list of the plants in cultivation in German gardens about the year 1561. This is obtained chiefly from Conrad Gesner's "*Horti Germaniae*," who quotes the different gardens (chiefly belonging to apothecaries and doctors) where the plants were grown. Coldenberg's garden in Antwerp contained many Spanish plants.

The list here given by Herr Wein should be of great importance to those interested in the story of gardens generally, and it is perhaps worth while to give a selection of some of the more interesting species mentioned.

A very large proportion of common or garden plants were already

in cultivation at this early date. Indeed the number of those already introduced shows that garden science must have been in existence somewhere in extremely ancient times.

There is, of course, an enormous number probably cultivated for their medicinal properties, and a very large proportion are wild German plants (though these are also often of wide distribution).

The fifteenth-century gardener in Germany grew Royal fern, male and lady fern, Polypody, *Asplenium Trichomanes* and *A. Adiantum nigrum*, as well as Bracken and many others, including *Ophioglossum* and *Botrychium*.

The Yew, Spruce, Silver Fir, Larch, Scots Pine, *Cupressus sempervirens*, and Juniper (both species) are given, as well as *Ephedra*.

Maize, Job's Tears, Sugar-cane, Sorghum, Millet, Gardeners' Garters, and *Briza media* are given.

So also *Cyperus esculentus*, Date Palm, *Arum maculatum*, *Colocasia*, and *Dracunculus*.

Amongst Liliaceae, *Veratrum album*, two Asphodels, *Hemerocallis*, *Aloe vera*, eleven species of *Allium*, four Lilies, *Ornithogalum*, Tulip, *Erythronium*, Hyacinth, *Muscari*, four species of *Asparagus*, *Ruscus*, Solomon's Seal, Lily of the Valley, and Herb Paris were known, and of Amaryllids *Leucojum*, *Narcissus poeticus*, *N. Pseudo-narcissus*, *N. angustifolius*, and others. Three species of *Crocus*, seven of *Iris*, and three Gladioli are noticed, also *Canna*, *Cypripedium*, and *Listera*, *Piper nigrum*, two Willows, Walnut, Hazel, Beech, Sweet Chestnut, *Ulmus campestris* (not Wych Elm), *Celtis*, Fig, Mulberry, and Hop. It is rather peculiar to find not only *Parietaria* but *Urtica pilulifera*, *Asarum*, four species of *Aristolochia*, six *Rumex* (including *Acetosella*), *Bistorta*, and *Polygonum Convolvulus*.

Chenopodiaceae included *Beta*, *Suaeda*, *Chenopodium Botrys*, *Salicornia*, Spinach, *Atriplex*, and *Kochia*.

The Amarantaceae were represented by *Celosia* (three species) and two *Amaranthus*.

Caryophyllaceae—*Silene* (two species), *Lychnis coronaria* and two others, three Melandriums, and four *Dianthus*, as well as *Saponaria officinalis* and *S. ocyroides*.

The gardens were particularly rich in Ranunculaceae, two Paeonies, Marsh Marigold, Globe-flower, three Hellebores, three Nigellas, *Actaea*, two Aquilegias, three Delphiniums, four Aconites, Clematis (two species), *Hepatica*, *Anemone coronaria*, *A. Pulsatilla* and three others, seven Ranunculi, two Thalictrums, and two Adonis.

Besides the Barberry, *Laurus nobilis*, *Hypecoum*, *Roemeria*, *Glaucium*, and Opium Poppy, one finds three species of *Corydalis*.

Of Cruciferae, four Lepidiums, *Iberis umbellata*, *Cochlearia*, *Alliaria officinalis*, *Sisymbrium*, Woad, *Eruca*, *Sinapis alba*, *Brassica oleracea*, *B. rapa*, *B. Napus*, *Raphanus*, *Barbarea vulgaris*, *Nasturtium officinale*, four Cardamines, two Lunarias, Camelina, Wallflower, *Matthiola* (two species), and *Hesperis matronalis*, *Capparis spinosa*, *Reseda luteola*, and *R. alba* were also grown. There were four *Sedums*

(including *S. roseum*) and two *Sempervivums*. They had six species of *Saxifrage* and four of *Ribes*, also *Platanus orientalis*.

The Rosaceae were also numerous enough in the gardens of 1561. *Aruncus*, *Cydonia*, six *Pyrus*, Medlar, Hawthorn, Amelanchier, Raspberry, Strawberry, six *Potentillas* (with *P. anserina*), three *Geums*, *Dryas*, *Filipendula*, two *Alchemillas*, Agrimony, *Sanguisorba*, but of *Roses* only seven species (*gallica*, *centifolia*, *damascena*, *moschata*, *rubiginosa*, *lutea*, and *alba*). They had nine species of *Prunus*. The Leguminosae seem to have been an oddly mixed collection, consisting of *Cercis*, *Ceratonia*, *Cassia fistula*, *Psoralea*, Broom and Whin, *Cytisus*, *Lupines*, *Trigonella*, three *Medicagos*, *Trifolium stellatum*, *Dorycnium*, *Lotus hispidus*, *Galega*, *Colutea*, *Astragalus*, *Glycyrrhiza*, *Ornithopus perpusillus*, *Coronilla*, *Hippocrepis*, *Onobrychis*, *Abrus*, *Vicia*, *Faba* and two others, *Lens*, *Pisum*, *Lathyrus*, and *Phaseolus vulgaris*. They grew *Geranium phaeum* and *sanguineum* as well as three others; also Wood Sorrel, *Tribulus Cneorum*, Lime, Orange; *Dictamnus* and two *Rues*; Dog's Mercury, Castor Oil, and no less than eleven *Euphorbias*. The Box was grown and also *Pistacia*, *Cotinus*, Holly, Spindle Tree, *Staphylea*, *Cardiospermum*, three species of *Acer*, Balsam (two species), *Palustris*, *Rhamnus*, and the Vine.

Tilia, *Abutilon*, *Lavatera*, *Althaeas*, *Mallows*, and *Hibiscus* were cultivated, and also three *Hypericums*. They had also *Myricaria*, three *Cistus*, and a *Helianthemum*. *Viola odorata*, *V. elatior*, *V. lutea*, and *V. tricolor* were grown. The Prickly Pear, four *Daphnes*, *Hippophae* and *Elaeagnus*, *Lythrum salicaria*, Pomegranate, Myrtle, four *Epilobiums*, Ivy, and a great number of *Umbelliferae*, amongst which were such common garden plants of to-day as Sanicle, *Astrantia*, *Eryngium*, Fennel, and Carrot, but also *Opoponax*, Coriander, Hemlock, *Smyrnum*, Bishop's Weed, Angelica, and many others. The Cornel, *Pyrola rotundifolia*, *Rhododendron ferrugineum*, *Loiseleuria*, and *Vaccinium Myrtillus* were cultivated. No less than eight *Primulas*, as well as *Cyclamen*, *Androsace*, *Lysimachia* (four spp.), and *Anagallis* (two spp.), may be mentioned. One notices also *Plumbago* and *Limonium*, *Styrax*, *Fraxinus*, Olive, Jasmine, Privet, nine *Gentians*, *Centaureum*, and *Menyanthes*.

Of *Apocynaceae*, the *Oleander* and both *Periwinkles* occur. There were three *Convolvulus*, *Ipomoea*, and *Cuscuta*, as well as Jacob's Ladder. Amongst the *Borages*, *Heliotropes*, *Cynoglossum*, *Borago*, *Alkanna*, *Anchusa*, *Pulmonaria*, *Myosotis scorpioides* and *M. silvatica*, three *Lithospermums*, and *Echium vulgare*. Both *Verbena* and *Vitex* occur. *Labiatae* were well represented; *Ajuga*, six *Teucriums*, Rosemary, three *Lavenders*, Horehound, Catmint, *Phlomis* (three spp.), *Stachys* (four spp.), *Salvia* (five spp.), *Melittis*, *Satureja*, Hyssop, five *Origanums*, Thyme, six *Mints*, and two *Ocymums*.

The *Solanaceae* *Mandragora*, *Atropa*, *Hyoscyamus*, *Withamia*, *Physalis*, *Capsicum*, *Solanum Dulcamara*, *Datura*, and Tobacco.

Many common *Scrophulariaceae* were in cultivation, notably *Verbascum* five, *Linaria* two, *Scrophularia* two, *Antirrhinum* two

Veronica four, and *Digitalis* three species ; also *Acanthus mollis*. It is remarkable to find *Pinguicula* and four *Plantago*s as garden plants.

The Woodruff, two *Galiums*, and Madder were grown, and also the Elder, two *Viburnums*, and three Honeysuckles.

There were two *Centranthus*, four *Valerians*, and *Valerianella olitoria*, also *Dipsacus Fullonum*, *Knautia*, and two *Scabious*. Amongst *Cucurbitaceae* were *Momordicas*, *Bryony*, *Citrullus*, *Colocynth*, *Cucumber*, and *Melon*, but there was only one *Campanula* (*C. Medium*) and *Jasione montana*.

The *Compositae* consisted of *Eupatorium*, *Solidago*, Daisy, *Aster amellus*, *Helichrysum*, *Inula*, *Xanthium*, *Bidens*, *Ambrosia*, *Anthemis* (four spp.), *Achillea* (six spp.), *Matricaria*, *Chrysanthemum* (*C. coronarium*, Ox-eye Daisy, and *C. Balsamita*), *Artemisia* (twelve spp.), Colt's-foot and *Petasites*, *Arnica*, *Doronicum cordatum*, *Senecio* (five spp.), *Calendula*, *Echinops*, *Carlina*, *Cirsium*, *Cynara Scolymus*, *Silybum*, *Onopordon*, *Centaurea* (four spp.), *Carthamus*, *Cnicus*, *Scolymus*, Chicory, Endives, *Tragopogon*, *Scorzonera*, *Lactuca*, and many others.

These medieval gardeners had also to contend with the same weeds as are still ubiquitous enemies to-day. Couch-grass, *Polygonum Aviculare*, Chickweed, Buttercup, *Veronica hederifolia*, Groundsel, Dandelion, and Sowthistles are specially marked as weeds, as well, no doubt, as many others in the above lists.

There were not many double flowers, yet *Roses*, *Ranunculus*, *Daisies*, *Violets*, *Daffodils*, and others are mentioned. They noticed and cultivated any flowers of unusual colours, but, as the author points out, plants were studied chiefly for their medicinal and other useful properties, though anything strange or peculiar might also be selected.

We think also, from certain remarks of the author, that even then plants were grown chiefly because none of the gardener's friends possessed them, and not for any particular beauty or property of the plants themselves.

Most plants seem to have been either mid-European natives or introduced from the Mediterranean region ; some, perhaps, from the East. The Tulip, *e.g.*, came from Constantinople or Cappadocia, and many varieties were grown at Vienna in 1575. The Hyacinth was probably known to the Romans, but was forgotten in the middle ages, though there is a herbarium specimen dated 1532 in Italy (Gherardo Cibo). It was figured in 1560, and Lobel saw it in 1562 in Pavia ; but Clusius, in 1582-1587, seems to have been the first to cultivate varieties of it.

Crete was an important centre of medicinal plants, but it was not until the end of the sixteenth century that many plants from this island were introduced.

Aloe vera (from India) was known in Italy in 1415, but did not reach Germany till 1539. There are several other Indian plants in the list.

There are many other interesting remarks in this paper, but this abstract has already become a little overgrown.—G. F. S. E.

Smilacina paniculata (*Bot. Mag.* tab. 8539).—Guatemala and Southern Mexico. *Nat. Ord.* Liliaceae, *Tribe* Polygonateae. Herb. Leaves ovate-lanceolate and acuminate, 5-6 inches long. Panicle terminal, 3 inches long, 2 inches broad. Many snowy-white flowers, $\frac{1}{4}$ inch across.—*G. H.*

Soil Fertility, Maintenance of (*U.S.A. Exp. Stn., Ohio, Bull.* 120).—Summary of results of experiments reviewed in Bulletins 182-3-4 (1906), Circular 83 (1907), 92 (1908), 104 (1909), 114 (1910).—*C. P. C.*

Soils for Glasshouse Work, Partial Sterilization of. By E. J. Russell (*Jour. Bd. Agr.* vol. xxi. No. 2, pp. 97-116; 3 figs.).—The report describes the work done in continuation of that dealt with in the previous reports which appeared in the "Journal of the Board of Agriculture" in January 1912 and January 1913.

The methods available for partial sterilization fall into two classes: (1) treatment by chemical means; (2) various heating methods.

During 1913 the chemical method was further investigated in an experiment with tomatoes in pots. The same antiseptics were used as before, and in consequence they can now be classified rather more accurately than was previously possible. The grouping arrived at is:

Class I.—Most effective—Formaldehyde, pyridine.

Class II.—Cresole, carbolic acid, calcium sulphide, carbon disulphide, toluol, benzol, petrol.

Class III.—Least effective—Naphthalene, &c. As in the earlier experiments, the plants on the partially sterilized soils made the best growth and gave the largest quantity of early fruit. After a time, however, the feeding, which was commenced after the fruit "set," began to equalize matters, and in the end there was little difference in the final yield. Examination of the roots showed that eelworm had not developed to any marked extent in the untreated soils, and the disease factor was much less in evidence than in previous years. The experiment demonstrates that partial sterilization serves to supply food when diseases no longer intervene. Formaldehyde is distinctively promising, but it costs 5*d.* per lb., while carbolic acid can be obtained below 1*d.* per lb. For the moment, therefore, carbolic acid has the advantage as an agent for commercial use.

For the present none of the chemical agents is as effective as heat for nursery work. During 1913 a number of trials was carried out in nurseries in the Lea Valley, and the results confirm the earlier laboratory work and pot experiments at Rothamsted and show that useful crop increases can be obtained by adopting partial sterilization methods in commercial establishments. No two men heated their soils in quite the same way; roughly speaking, however, the methods adopted fell into four groups: 1. Hot water; 2. Baking; 3. High-pressure steam; 4. Low-pressure steam. The hot water gave satisfactory results in some cases, but it is not clear exactly what the effect was, for flooding with cold water has been found beneficial in some

cases. Each of the other three methods proved workable in practice, and each has its advocates, its advantages, and its disadvantages. It is too early yet to judge between them, but the great determining factor must necessarily be cost. This matter is therefore dealt with.

In some of the trials with tomatos the soil was treated *in situ*, since the plants were grown in borders. In these cases fear was entertained that the plants might develop too vigorous a habit of growth to "set" their fruit well. It was true that the "setting" was always good in the Rothamsted experiments, but there the plants were grown in pots, where the root system was necessarily restricted. It was found, however, that the vigorous growth induced did not necessarily interfere with the "setting" of the fruit; by adopting precautions as to the varieties selected, size of the plant at the time of setting out, withholding water and manure, and keeping on the heat, some of the growers succeeded in getting as good a "set," or better, on heated than on unheated soil. The results from the various nurseries were alike in showing a higher return for steamed than for unsteamed soils. Moreover, the early pickings were higher on the steamed soils, and of course it is the early results that pay.

It is the usual practice with cucumber-growers to reject on account of "sickness" soil which has already borne a crop, and to make new borders with virgin loam and straw manure. Experiments at Rothamsted have shown that the "sickness" can be removed by steaming, and that soil so treated will allow of normal healthy plant development. The grower, however, is not particularly concerned with any comparison between steamed and unsteamed "sick" soils, but wants to know whether the steamed soil is as good as virgin loam. Trials were therefore made in several houses, and it was concluded that although steamed old soil is probably not quite so good as virgin loam, it might, on account of its cheapness, be with advantage used to replace virgin loam partially in making new beds.

In some earlier experiments with "chrysanthemum-sick" soil it was shown that not only could chrysanthemums be grown with safety on such soil after it had been steamed, but that in addition the flowers produced were larger and of greater substance than those from untreated soil. During 1913 experiments were carried out with a view to testing more completely the question of flower size. Four sterilizing agents were used, viz. heat, toluol, formaldehyde, and calcium sulphide. The plants were all of the same variety. The flowers on the heated soil were slightly earlier than those on the untreated. The leaves and flowers were larger and heavier. The chemicals did not cause any increased growth. These results are reflected in some chemical and bacteriological analyses which are given. The nutritive compounds available in the heated soil are not quite the same as those in the untreated soil, and the percentages of nitrogen, phosphoric acid, and potash in the leaves, stems, roots, and especially in the flowers of plants grown in heated soil, are higher than in those raised on the untreated. This is clearly shown by the analyses quoted.—A. S.

Soils in the Field, Partial Sterilization of. By E. J. Russell (*Jour. Bd. Agr.* vol. xxi. No. 2, pp. 114-115).—A short note is given on this subject in an article dealing mainly with the partial sterilization of soils for glasshouse work. Some experiments have been started to ascertain whether some new factor comes into play when partial sterilization is extended from the glasshouse to the field. A number of antiseptics have been used, the method being to inject the substance six inches into the soil by means of a hand injector, such as is used in Continental vineyards, the holes being ten inches apart each way. The great difficulty has been to make the distribution at all efficient and to make the injections at the right time. These mechanical difficulties have not yet been overcome, and in the outdoor experiments antiseptics have failed to produce consistent and regular increases in crops, although pot experiments with the same soils showed that increases of 20 to 50 per cent. could be obtained when the distribution of the antiseptic was more efficiently carried out. The results for the three years 1910, 1911, and 1912 are given.—A. S.

Soils, Selective Adsorption by. By E. G. Parker (*Jour. Agr. Research*, i. pp. 179-188, Dec. 1913).—The experiments recorded by the author show that soils not only have the power of adsorbing dissolved salts from solutions but also of adsorbing one ion at a greater rate than the other, or selectively adsorbing, to a marked extent. The presence of various salts may alter the relative amounts of ions adsorbed, but in general the quantity of potassium adsorbed from potassium chloride is greater than that of chlorine, and the finer the soil particles the greater the quantity of potassium adsorbed.—F. J. C.

Soils, The Presence of some Benzene Derivatives in Soils. By E. C. Shorey (*Jour. Agr. Research*, i. pp. 357-364, Feb. 1914).—Three organic compounds—benzoic acid, metaoxytoluic acid, and vanillin—were isolated from soils, and their properties are discussed by the author.—F. J. C.

Soy Beans. By E. H. Jenkins (*U.S.A. Exp. Stn., New Haven, Bull.* 179, October 1913, pp. 1-13; 4 plates).—The soy bean is useful as a catch crop when winter grain, clover or grass seed fails. It stands drought better than corn, but is killed by a moderate frost. It is a nutritious forage for cattle or swine, as it is rich in protein.

S. E. W.

Spray Calendar. By W. J. Green, A. D. Selby, and H. A. Gossard (*Ohio Exp. Stn., Bull.* 232, Dec. 1911; 3 figs.).—This is a revised edition of an earlier bulletin (No. 199) and includes preparations of washes and sprays as fungicides and insecticides, and the treatment of seeds and soils against certain diseases, the former generally with formaldehyde and the latter by sterilization.

The recommendation to use lime-sulphur 32° Baumé as strong as one part with eight of water during autumn and winter on apples

&c. for San José, which scale is higher than the strength generally used in this country as a winter wash, suggests the confidence of the Ohio Experimental Station in its safety on dormant trees.—*W. A. V.*

Spray Calendar, with Seed, Soil, and Disinfection Methods of Treatment (*U.S.A. Exp. Stn., Ohio, Bull. 232, 1911*).—A very valuable work on how to make and use insecticides and fungicides, a number of methods of treating soil and stored grains, concluding with a valuable spray calendar, and an account of cost of spraying and mixing outfits.—*C. P. C.*

Spraying Machinery, Care of (*Dep. of Agr. and Tech. Instr. for Ireland*).—The external bearings of the spraying machine should be frequently oiled, but care should be taken not to let any of the oil get upon the rubber parts of the machine. The machine should be well washed out with water immediately after use, thoroughly cleaned and dried, and the pump oiled before being put away.—*C. H. H.*

Stapelia Leendertziae (*Bot. Mag. tab. 8561*).—Transvaal. *Nat. Ord.* Asclepiadaceae, *Tribe* Stapeliceae. Herb., leafless, succulent. Stem, 3–5 inches long, 4-angled. Flowers solitary or in pairs. Corolla campanulate, fuscous-purple throughout, 2–2½ inches long, 2½ inches across.—*G. H.*

Strawberry 'Chesapeake.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull. 364*).—A late-blooming variety of very high quality. Raised by Mr. J. W. Parks, of Nanticoke, Md., U.S.A.
E. A. Bd.

Strawberry Culture, Commercial. By S. B. Shaw (*U.S.A. Exp. Stn., N. Carolina, Bull. 187, Aug. 1913; figs.*).—An account is given of the field cultivation of the strawberry with suitable varieties, none of which are British. We do not gather how much space is given the plants, nor what tools are used in cultivating. Deep cultivation is recommended until the end of August, after the berries are gathered, after which shallow cultivation only is called for.—*F. J. C.*

Strawberry 'Prolific.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull. 364; plate*).—A seedling raised at the Geneva Station. Extremely vigorous and prolific.—*E. A. Bd.*

Sugar and Acid in Oranges and Grape Fruit. By S. E. Collinson (*U.S.A. Exp. Stn., Florida, Bull. 115, 1913; 23 pp.*).—As oranges mature the total sugar increases and the acidity decreases; in grape fruit a similar but less marked change takes place.—*S. E. W.*

Sugar Beet and Nasturtium Leaves, A Bacterium causing a Disease of. By N. A. Brown and C. O. Jameson (*Jour. Agr. Research, i. pp. 189–210, Dec. 1913; figs.*).—An organism for which the name *Bacillus aptatum* is suggested was isolated from nasturtium

leaves showing water-soaked and brownish spots about 2-5 mm. in diameter, and from sugar beet on which dark brown (often black) irregular spots and streaks were present. Cross inoculations proved the identity of the bacilli from the two sources, and it was also found to be pathogenic to bean leaves and pods, lettuce, pepper, and egg plant foliage. It probably enters the plant by wounds or by insect injuries, and may be spread by insects.—*F. J. C.*

Sugar Beet Leaf Spot. By V. W. Pool and M. B. McKay (*U.S.A. Dep. Agr., Bull.* 121, 1913, pp. 14-17).—The leaf spot on the sugar beet is caused by the fungus *Cercospora beticola*, which lives through the winter on the old beet tops. The beet tops should be removed, while still green, and made into silage. Five pounds of salt are added for each ton of beet tops. The fungus does not survive this treatment.—*S. E. W.*

Sugar Beet, Curly Top. By H. H. Bunzel (*U.S.A. Dep. Agr., Bull.* 277, 1913, pp. 1-28).—The leaves of sugar beets suffering from curly top contain two or three times as much oxidase as the leaves of healthy plants.—*S. E. W.*

Sugar Beets, Deterioration in Quality due to Nitrates formed in Soil. By W. P. Headden (*U.S.A. Exp. Stn., Colorado, Bull.* 183, 1912).—The author brings forward substantial evidence to show that large additions of nitrates to soil caused serious deterioration in the quality of beets, lessening the sugar content, and causing heavy growth of tops, at the expense of the roots.—*C. P. C.*

Sulphate of Copper and Washing Soda for Potato Spraying.—The Department of Agriculture for Ireland recommends the use of carbonate of soda in preference to lime for the following reasons:—

1. The spraying mixture adheres longer to the foliage of the plants, and is not so readily washed off by rain.
2. The mixture can be more easily prepared.
3. The nozzles of the machine are not so liable to become stopped with grit or refuse material. If washing soda is used and the mixture is carefully made, there should be no sediment.—*C. H. H.*

Sweet Peas. Pt. I. by J. Craig and A. C. Beal. Pts. II and III. by A. C. Beal (*U.S.A. Agr. Exp. Stn. Cornell University, Bull.* 301, 1911, pp. 749-764, 1 plate; *Bull.* 319, 1912, pp. 620-656, 12 figs.; *Bull.* 320, 1912, pp. 659-713, 13 plates, 11 figs.).—A monograph of the sweet pea, containing little new information for the grower of this favourite flower. The cultural directions are summarized thus: Trench deeply, manure liberally; plant thinly; stake quickly, water freely, and dispod promptly.

When sweet peas are in full flower, give weak liquid manure once a week; alternate with sodium nitrate or ammonium sulphate (1 oz.

to 6 gallons of water). Potassium nitrate and phosphate of the above strength are also beneficial.

The unpopularity of the Cupid sweet pea is due to the fact that the flowers are on short stems, and also that the White Cupid did not germinate well. The black seeds germinate freely. In a wet season, the flower-buds drop off.

Dwarf sweet peas require a rather dry, moderately rich soil, and a dry, hot season. Withered flowers and pods must be promptly removed.—S. E. W.

Sweet Potato, Black Rots of. By J. J. Taubenhause (*Phytopathology*, iii. p. 159, June 1913; figs.).—There is more than one form of black rot in the sweet potato, the commonest being due to *Sphaeronema fimbriatum*, and not causing the rotting of the whole root. Charcoal rot affects the whole root, and is due to *Sclerotium bataticola* n. sp. There is a third form in which the tubers show dark shrivelled patches, over which are scattered numerous pycnidia due to the fungus *Lasiodiplodia tubericola* and called the Java rot.—F. J. C.

Sweet Potato, Foot Rot of. By L. L. Harter (*Jour. Agr. Research*, i. pp. 251-274; Dec. 1913; plates).—This disease has already been referred to in these abstracts (*JOUR. R.H.S.* vol. xxxix. p. 804). The present communication gives a fuller description both of the disease and of the organism producing it (*Plenodomus destruens*) than was contained in the former paper.—F. J. C.

Temperature and Growth. By B. E. Livingston and G. J. Livingston (*Bot. Gaz.* lvi. pp. 349-375, Nov. 1913; with 3 maps).—It has been found by Price that the time required from the resting period to the opening of the flower-bud in the case of various fruit trees is reduced by about one-half for each rise in temperature of 10° C. So, also in the growth of maize seedlings, the rate of growth is nearly doubled for each rise of 10° C.

The authors assumed, therefore, 2 to be the temperature coefficient for every rise of 10° C. in temperature. They calculated these coefficients for a very large number of stations over the whole of the United States, using Bigelow's daily normal temperatures (published by the Weather Bureau), but only for the interval between the last spring and the first autumn frosts.

The results are shown in one of the maps. Another map shows results obtained by simply adding up the normal daily mean temperatures (Van 't Hoff, Arrhenius' system).

In a broad and general way, and for most of the United States, the climatic zones shown in the two maps agree with one another. A third map shows the distribution of the ratios of the direct adding to the efficiency summation data.—G. F. S. E.

Thismia. By Norma E. Pfeiffer (*Bot. Gaz.* Feb. 1914, pp. 122-135; 5 pls.).—The author found in the open prairie near Chicago a new

species of this interesting Burmanniaceous genus. The species is described and a very full account is given of its anatomy, development, &c.

The entire plant is glabrous and white; the subepidermal cells are full of coarse, septate fungus-mycelium. The main subterranean structure is a root with root-cap, but is much reduced in vascular tissue. Flower axis and roots arise endogenously from the main root or from the base of the former. The ovules are anatropous, two-coated, and a few-celled embryo is imbedded in a mass of endosperm. Insect pollination seems necessary. The plates are particularly clear.

G. F. S. E.

Thistles, Canada. By H. R. Cox (*U.S.A. Dep. Agr., Bull.* 545, 1913, pp. 3-14; 6 figs.).—The Canada thistle (*Cirsium arvense*) can be exterminated by repeatedly cutting off the tops.—S. E. W.

Thrips on Potato Foliage. By C. French (*Jour. Dep. Agr. Victoria*, Dec. 1913, p. 730).—35 up to 75 lb. of lime to 100 gallons of water is highly recommended.—C. H. H.

Tobacco Crop in Connecticut. By E. H. Jenkins (*U.S.A. Exp. Stn., Conn., Bull.* 180, 1914, pp. 1-65; 15 plates).—Experiments were made to determine the effect of various fertilizers on the character of the tobacco leaf. Sulphates exert a deleterious influence on the burning quality of the leaf. A supply of nitrogen in the form of castor pomace or cotton-seed meal improved the quality and increased the quantity of the crop. If the tobacco plants are attacked by root rot, the ground must be sterilized by superheated steam or formaldehyde, the former by preference, before planting. Calico or mosaic disease is easily transmitted by handling a healthy plant after handling a calicoed one. A bibliography of works on wrapper leaf tobacco is given.—S. E. W.

Tobacco, Flue-cured. By E. H. Mathewson (*U.S.A. Dep. Agr., Bull.* 16, 1913, pp. 1-36; 12 figs.).—The author discusses the question of the rotation of crops and the use of fertilizers for flue-cured tobacco. He also describes the cultivation and harvesting of the crop.—S. E. W.

Tomato, Influence of Crossing on Increasing the Yield of. By R. Wellington (*U.S.A. Exp. Stn., New York, Bull.* 346, March 1912).—The effect of crossing a dwarf with a tall variety was to increase the yield to a great extent, as compared with the amount of fruit obtained from either parent.

The cross gave an advantage of six tons from an acre, but the gain was lost if the hybrid was self-fertilized and grown for three generations.

The author suggests that seed-growers could with advantage raise F_1 generation seed, as a higher price should be obtained for it.

C. P. C.

Tomato Insects, Root-knot and "White Mold." By J. R. Watson (*U.S.A. Exp. Stn., Florida, Bull.* 112, Dec. 1912; 23 figs.).—The bollworm or tomato fruit worm (*Heliothis obsoleta*); root knot, caused by *Heterodera radiculicola*; thrips (*Euthrips tritici*); cut worms (the larvæ of the Noctuid family of moths); horn worms (*Phlegethonius quinquimaculata* and *P. sexta*), tomato aphid, flea beetles, and sundry other insects, are described and figured in this bulletin, together with methods for their prevention and control.—V. G. J.

Tomatos and Tobacco, Mosaic Disease of. By G. H. Chapman (*U.S.A. Exp. Stn., Mass., Ann. Rep.* 1912, p. 41, Jan. 1913).—In this disease the leaves first present a mottled appearance of light and dark green. The light portion grows slowly, the dark normally. In tomatoes the light portion becomes yellowish, or finally purplish-red. The author considers the disease to be purely a physiological one, due to excessive activity of oxidase and peroxidase enzymes, and the partial loss of function of catalase. It is infectious, but not contagious. It does not occur in seed-beds when new soil is used, nor in properly sterilized seed-beds, but imperfect sterilization tends to accentuate it. High temperature seems to conduce to the trouble, but excess of mineral fertilizers does not appear to increase it. A good bibliography is given and a further paper promised.—F. J. C.

Tomosis or Leaf Cut. By O. F. Cook (*U.S.A. Dep. Agr., Bull.* 120, 1913), pp. 29-34; 1 fig.).—Young cotton plants often suffer from leaf cut or tomosis when a cold night is followed by a hot morning. The leaves are mutilated, and the terminal buds and sometimes the axillary buds are aborted.—S. E. W.

Town Manure, Loss of Weight in (*Jour. Bd. Agr.* vol. xxi. No. 2, pp. 133-135).—The results are given of some experiments which have recently been conducted by Pickering at the Woburn Experimental Fruit Farm, in order to estimate the loss of weight which may be expected to occur in town manure in course of transit.—A. S.

Trees, Diseases of, in the Appalachians. By A. H. Graves (*Phytopathology*, iii. p. 129. Apr. 1913; figs.).—Bark blight of *Pinus Strobus* due to *Cocomyces pini* Karst., heart rot caused by *Trametes pini*, and leaf blight of the same tree due to *Lophodermium brachysporum* are fully dealt with.—F. J. C.

Triocytis stolonifera (*Bot. Mag.* tab. 8560).—Formosa. *Nat. Ord.* Liliaceae, *Tribe* Uvulariæ. Herb, 2 feet high. Stem reddish-purple. Leaves, elliptic-lanceolate, 8 inches long. Inflorescence lax. Perianth purple, blotched, saccate at the base.—G. H.

Turkestan, Flora of. By Olga and Boris Fedtschenko (*Beih. Bot. Cent.* xxxi. Abt. 2, Heft 1, pp. 111-175).—This is a continuation of the "Conspectus Florae Turkestanicae" previously published, and contains Compositae from *Calendula* to *Gerbera*. New species are referred to, but seem to have been published elsewhere.—G. F. S. E.

Vegetation, Indicator Significance of, in Tovele Valley, Utah. By T. H. Kearney, L. J. Briggs, H. L. Shantz, J. W. McLane, and R. L. Piemeisel (*Jour. Agr. Research*, i. pp. 365-418, Feb. 1914; plates).—After describing the soils, climate, and geology of the region under investigation, an attempt is made to classify the types of vegetation, the following types being recognized:—"Sage-brush association" (*Artemisia tridentata* dominant); "Sand-hill mixed association" (*Artemisia tridentata*, *Juniperus utahensis*, *Chrysothamnus nauseosus albicaulis* dominant); *Kochia* association (*Kochia vestita*); Shadscale association (*Atriplex confertifolia*); Greasewood-shadscale association (*Sarcobatus vermiculatus* and *Atriplex confertifolia*); Grass-flat communities (*Distichlis spicata*, *Sporobolus airoides*, *Chrysothamnus graveolens glabratus*); and Salt-flat communities (*Allenrolfea occidentalis*, *Salicornia utahensis*, and *S. rubra*). Each of these associations is then dealt with in detail, and the botanical composition, soil characteristics, &c., given, together with excellent plates and numerous diagrams of root systems, adaptations, and the like.—F. J. C.

White Fly, The Greenhouse. By A. W. Morrill (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 57; 1 fig.).—The damage done by the greenhouse white fly (*Aleyrodes vaporariorum* Westw.) to tomato, cucumber, and many other plants easily places it in the front rank of greenhouse pests. It occurs in Europe, Canada, Mexico, and is widely distributed throughout the Eastern United States. Fumigation seems to be the best remedy.—V. G. J.

White Grubs, Common. By John J. Davis (*U.S.A. Dep. Agr., Farm. Bull.* 543, July 1913; 12 figs.).—These grubs (*Lachnosterna* spp.) have for years been recognized as a serious pest to farm crops, notably corn and timothy, while strawberries, potatoes, and nursery plantings, particularly conifers, have all been frequently and seriously affected.

Knowledge of their life-histories is very meagre, there being only one published record, involving a single species, in which an individual belonging to this genus has been raised from egg to adult. The life-cycle may be two or three years, or may extend over a period of four years, as is the case in a closely-related European species (*Melolontha vulgaris* L.). Fall ploughing, and the turning loose over infected areas of pigs and poultry (particularly turkeys) when the ploughing is in progress, prove of great service in controlling the pest.—V. G. J.

Woodlice, The Economic Importance of. By W. E. Collinge (*Jour. Bd. Agr.*, vol. xxi. No. 3, pp. 206-212; plate).—The article deals at some length with the life-histories and habits of the more common species of woodlice, which on occasion cause serious loss to horticulturists. Under the heading of "Preventive and Remedial Measures" it is said that there is no doubt that neglect to clean out outhouses, potting sheds, and similar places, from time to time, has much to do with the increase of woodlice. Again, rubbish heaps are frequently left to afford admirable breeding-places. A long series of outdoor tests with baits was made in order to find out what

substances might be used to attract the woodlice, and another series to ascertain the most advisable poison. A series of tests with repellents was also made. It was found that sliced potatoes given a thin covering of Paris green or London purple proved most effective. London purple also proved the best repellent. Kerosene emulsion as a contact spray was fatal. In a greenhouse it was found that sprinkling Paris green on the floor and covering it with damp boards was very effective. On the first morning there were 137 dead specimens, on the second 59, and on the third 21. Dusting the soil, especially along the sides of tiles surrounding flower-beds, with equal parts of Paris green and ground unslaked lime is an excellent remedy. The loose straw and rubbish that collect around manure heaps should be raked together and burnt before the manure heap is opened for use. In this way many hundreds of woodlice may be collected and destroyed.—A. S.

Woodlice, To destroy (*Jour. Dep. Agr., Victoria*, Dec. 1913, p. 548, in article "Insect Pests of the Potato," by C. French).—Trap by placing in the haunts of the woodlice pieces of parsnip, beetroot, or potato cooked in a solution of arsenic. They eat these greedily. They can also be trapped in large numbers by placing empty boxes (or bones on top of old sacks) at the side of the garden, and into these the woodlice will creep on the approach of day. If the woodlice are in the ground, vaporite well worked into the soil destroys them through the gas evolved.—C. H. H.

Wood-oil Tree, The Chinese. By David Fairchild (*U.S.A. Dep. Agr., Circ.* 108, April 5, 1913).—Valuable for wood or tung oil which the nuts contain, said to be the best drying oil known, and likely to revolutionize the varnish industry of the United States. The tree succeeds well on heavy clay soils and in dampish situations.—A. D. W.

Woods Grown in the United States, Mechanical Properties of. (*U.S.A. Dep. Agr., For. Serv., Circ.* 213, March 24, 1913).—A valuable table of the various tests that have been carried out by the Forest Service—about 25,000 in number. Tension, cleavage, and other properties are gone into.—A. D. W.

Woods of the United States, Uses of Commercial. By H. Maxwell (*U.S.A. Dep. Agr., For. Serv., Bull.* 12, Oct. 11, 1913).—Beech, birch, and maple would appear to be representatives of the three genera that are of most value for commercial purposes.—A. D. W.

Zinc Arsenite as an Insecticide. By J. W. Schoene (*U.S.A. Exp. Stn., New York*, March 1913).—It is herein shown that zinc arsenite is quicker in action than lead arseniate, but, on the whole, causes much more spray injury to foliage.—C. P. C.

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PART III.

INFORMAL AND WILD GARDENING.

By JAMES HUDSON, V.M.H.

[Read October 6, 1914, Dr F. KEEBLE, F.R.S., in the Chair.]

I DO not wish in any way to condemn formal or set gardening, but I think we still see too much of it. Formal gardens, no doubt, have their place in the wide field of horticulture, but they soon cease to charm. Many of the garden designs of the seventeenth, eighteenth, and nineteenth centuries appear set and formal. The most prominent feature in them generally is the elaborate architecture, frequently most costly both in design and upkeep. This is perhaps not so much the case in our own country as in France and Italy, especially the latter. The most formal of these gardens might almost be kept in order by a machine, no room being left for the true art of gardening. The formal or the geometrical garden has a tendency to make those who look after it quite formal too. In such gardens every plant must be in its exact position to an inch, and every one must correspond with or stand in strict relation to another.

Again, in the formal garden there is generally too much repetition. This may produce a gorgeous blaze of colour, but it is not in the best sense effective. Where there is too much repetition there must necessarily also be waste of material. When the system of bedding out was at its height, the glass-houses through the spring months were crowded to excess with bedding plants, to the injury and weakening of the permanent plants therein. A vast amount of labour was spent over this work, labour that might have been employed in far more profitable ways and labour is a serious item in these days.

The sooner then that "carpet bedding and ribbon borders" are consigned to the limbo of obscurity, the better will it be, both for those who look after them and from the point of waste of material. It should be possible to arrange any flower garden in such a way as to have not more than two beds, at the very most, of any one kind of plant, for variety is infinitely better than repetition. In one direction there has been an improvement of late years in the arranging of what I would describe as "picture beds," i.e. beds that are relieved by taller plants in the centre or at the back, in which way the formality is considerably lessened. These beds, when arranged with good taste as to colour, are undoubtedly effective.

A system has grown up of late years, especially in public parks, of frequently renewing the plants. Plants are put out into the beds which cannot in any sense be termed suitable for general purposes. The beds or borders, as the case may be, look remarkably well for a time, and as soon as the plants begin to fade they are lifted and another lot put out in their place. Thus a wonderful display may be kept up, but it is not done in what I might term a fair way, as contrasted with those gardens which have not the accommodation, or the resources to provide the second lot of material. Not in one private garden in a thousand is there accommodation for bringing forward a sufficient supply of plants to treat the bedding in this way, nor do I think it ought to be encouraged. I have noticed in some of our well known public gardens what a crowding there is of material to produce the desired effect just for the time being. It is well known that these supplies of plants are brought forward in houses and pits built for that purpose alone. In private gardens, therefore, it is next to impossible to compete with such cases as these. I well remember, when I was a young man, being told not to give too much heed to the cultivation of bedding plants which occupied the houses and pits to an excessive degree, and that advice was not lost. Nowadays, I am pleased to see more attention is being given to such plants as *Antirrhinums* and *Pentstemons*—to name only two instances of almost or quite hardy plants; these and the *Viola* will no doubt play a more important part in the future than they have done as yet.

It may be asked what do I mean by "Informal Gardening," and what are its advantages? It has several points in its favour, as I hope to show.

1. It is more economical.
2. It is more easily accomplished.
3. It is more attractive the year through, at least to all real garden lovers and enthusiasts.
4. It affords greater space for greater variety.

1. *As to Economy.*—This is attained in two ways. First, there need not be the waste of material—I mean the waste of having an excess of one kind of plant. In an informal garden there will be scope for variety rather than too much of one thing. The larger the garden, the greater should be the variety as a matter of course. Secondly, a

better result will ensue from the same amount of labour, and in consequence the cultivation can be maintained at a higher standard.

2. *As to its Accomplishment.*—It will be found to be an easier matter to manage an informal than a formal garden, for in an informal garden every opportunity will be or should be taken to find the most suitable position for any plants you may have, and no hard-and-fast rule will be made that certain plants must be put in certain places. Again, an informal garden may begin in quite a small way and be extended according to the tastes of the owner, or according to the suitability of the situation and soil for certain plants, as found out by experience.

3. *As to Attractiveness.*—If not at any one particular time so showy, an informal garden that is well planted and in good condition will be found more attractive the year round. More attention can be centred upon individual plants, and each of these can be made to display itself to the best advantage.

4. *As to greater Variety.*—This almost speaks for itself as being a feature of such a garden. It should also be one of the great essentials of every well managed garden; and as regards space this also should be apparent, for by dispensing with the number of any given plant, more room is afforded for those that are being grown to develop in the best possible manner.

Waste of Material.—This occurs in various ways, one of which is that of planting or grouping too many shrubs or plants together, *en masse*, which cannot help but produce a formal effect as the plants grow; another way is the overcrowding of them at planting time to produce what is called immediate effect. These, as they grow, crowd each other and in the end are often all spoilt or made most unsightly by leggy, straggly growth. On the other hand, in an informal garden more reliance can be placed upon individual shrubs, trees, or plants, and each plant may have given it the opportunity of ultimate development. In the planting of shrubs it is customary to allow for only narrow margins of turf and then the gravel walk or road. It is far better to keep the shrubs well set back or to increase the width of the turf. The effect produced by a broad margin of turf adds greatly to the general appearance. It is an all too common practice to plant too many shrubs as an undergrowth to trees, thus impoverishing the trees, and notably so if the position be at all dry. Two or more decades back it was a very general custom to plant the Common Laurel upon banks, or in masses under young trees, and the Laurels would have to be cut over each season to a level height. I could never see the object of this system of planting. In no sense could it be called beautiful, but extremely formal, and it creates a vast deal of labour and ultimately starves the trees under which such planting is done. An undergrowth of Ivy would give far less trouble, but even that would impoverish the ground. In such situations I would rather use the common British Ferns than anything else, and plant Daffodils among them for spring flowering, and Colchicums or *Crocus speciosus* for the autumn.

Wherever there are numbers of timber trees that have been too thickly planted—or should I not say, that were not thinned out when they should have been—there, if it be possible, encourage a carpeting of grass, with, say, Daffodils and Snowdrops. The boles of large trees should never be hidden, for they are distinctly ornamental at all seasons of the year. The familiar quotation of “Woodman spare that tree” is often applicable to the formal style of garden. If a tree be ever so beautiful it has to succumb to the inevitable, if it be so unfortunate as to stand in the way of a formal design. This occurs frequently when a new house is being erected. But why not alter the position of the site somewhat and spare the tree? Adjust the building to fit it in with the surroundings, and save the tree. Before it became the fashion to enclose the house on all sides with formal and kept gardens and shrubs, it was the custom to let one side at least abut upon a park-like open space—lesser or greater as the case might be. This method is excellent, as it adds rusticity to the view, with cattle grazing in all probability in the immediate foreground. Many views of country houses have been taken where this arrangement prevails; and where the grounds slope away from the building an opportunity is offered for most picturesque planting and grouping.

The Formal Pruning of Shrubs.—I ought to draw attention to this most stupid system, though it is practised more, I think, in public parks and gardens than in private places. There is an old saying that there is “a time for doing everything under the sun,” meaning that there is a right time and a wrong. With shrub pruning the late summer and autumn appear to be considered right. Then it is that this “tidying up” is proceeded with. Then it is that flowering shrubs are oftentimes denuded of shoots and branches which would otherwise add beauty to the coming season. Then it is that one often sees the flowering currant (*Ribes sanguineum*) carefully pruned into the correct shape; also *Forsythia suspensa* and *F. viridissima*, to say nothing of the Lilac or of *Jasminum nudiflorum*. Nothing is, I think, more beautiful in March or early April than the Forsythias when treated informally. If pruning be needed, do it by all means, but let it be immediately after the flowering stage is over; but in no instance should any shrub be clipped over in a rigid, formal manner.

Informal gardening is beyond any dispute more economical in every way. Not only is this the case as regards the actual amount of attention needed, but also in the preparation of the material for planting out. There should not be any hard-and-fast time for “bedding out,” as it is termed. The arrangement should be such that the vacant spaces—either beds or borders—should not be actually bare of plants at any time, bearing in mind the due provision of stock to take the place of such as may be exhausted.

I have just used the word “beds.” Let me say at once that I do not favour beds as compared with borders, *i.e.* marginal borders to shrubs and the like. Rather let the one join insensibly on to the other. Do not let geometrical design be considered as any ornament in itself;



FIG. 82.—THE WILDERNESS SHIRLEY, CROFTON
ROSES AND OX-EYE DAISIES IN THE GRASS



FIG. 83.—CORNER OF THE LAWN, THE WILDEST, SUILOU
ROSES AND ON-PAI PAISH-S IN FOREGROUND



FIG. 84.—SUNNY PATH, THE WINDING, SHERIDAN
CLOSES RIGHT AND LEFT



FIG. 95.—OLD TENNIS GROUND, THE WILDERNESS, SHIRLEY
PICEA PUNGENS GLAUCA AND *CISTACEA*.

better dispense with it entirely. Get rid once and for ever of all idea of formality and then try to imitate nature, or rather work in accord with nature. It is not easy in many cases to do this, but an effort should be made in that direction. Then, having made a start, we may feel greater confidence in extending in the immediate future.

It may be asked—How and where would you commence to treat a garden in an informal manner? I would start immediately contiguous to the house itself. The building itself would be of a formal character, not necessarily square or rectangular, but probably straight lines will prevail. With these one cannot associate curves, as regards beds, so as to be in harmony with the surroundings. I would therefore start away at once with the lawn, and if any planting be done near the building let it more or less follow the lines of the building. I would not permit any terraced walks of gravel to obtrude, so to speak, on the view. Personally I favour a verandah on two sides at least; here an excellent opportunity is afforded of furnishing the walls with rather choice and possibly somewhat tender wall plants. It may be said—Why have but few gravel paths? My reply is, we often have too many of them. Paths add to the expense of upkeep, as all gardeners know. Rather expend the same amount of labour in actual cultivation, is my advice. I would in any case dispense with broad walks, and the sooner these are lost to view from the house the better as regards effect. Let the lawn near to the house be the chief feature, with plants or shrubs of divers kinds dotted thereon. This planting should be done quite informally. Let the grass be kept closely mown for a reasonable distance away from the house. Then I would break away into a semi-wild style of gardening, with the grass cut only once or twice in the year. Paths to suit the exigencies of the case will have to be arranged. Let these be of grass wherever possible and only sufficiently wide for two, or at the most three, to walk abreast. Such paths may curve according to the position and levels, but straight paths are inadvisable—*i.e.* straight for any great distance. In a garden so treated there will be a great saving of labour in upkeep, such as in sweeping, mowing, rolling, &c. No drains will have to be provided, as in the case of gravel paths, to drain off the water in order to keep them dry. With grass paths the water will soak away into the soil and be a benefit, as it should be to the surrounding vegetation.

In the distance let the arrangement be such as to make foreground and background merge insensibly together. Do not attempt to shut out the view if it be such as one could wish. Where trees exist, let the idea be to blend all new planting with them. They may be most invaluable as shelters from the most harmful winds, notably the east and north-east. Deciduous trees act as a great break to keen, cutting winds, but I like to have some Fir trees as screens. Where no such screens exist some should be provided, whether the garden be formal or informal. My advice was once asked anent this for a most exposed position on the east coast. I advised the planting of the Canadian

Poplar. These grew well and afforded shelter to the Austrian Pines and the latter formed the screen so much desired, and then gardening in a most successful manner was accomplished. Of course it takes a few years to do all this.

It is only natural that I should be asked "What is your idea of an Informal Garden?" I will give one or two examples. First, I will allude to the Wisley Gardens of the Royal Horticultural Society. These afford an almost unexampled illustration of informal gardening, in the combination of the Wild Garden and the Rock Garden with their immediate surroundings. But it may be said there is no mansion at Wisley. True, but if such were built upon the higher ground it would be an ideal example in every respect, healthy beyond any question, with splendid views and the informal gardens at one's feet, so to speak. First you have the Rock Garden with the open informal garden on the east, backed up by the fine avenue of Bamboos, and the Water Garden where the *Nymphæas*, *Iris Kaempferi*, and *Gunnera manicata* luxuriate. Next to these is the Wild Garden amidst the shelter of the trees, a garden of the woods, a type of gardening of which more use should be made. To my mind this is the most enjoyable part of the Wisley Gardens. Onward towards the river there are ideal types of Herbaceous gardening. Where the trials are conducted it must of necessity be of a formal character for greater facilities in working. When Mr. G. F. WILSON—a keen and thorough gardener—took over this property he had an undoubted knowledge of the soil, the surroundings, and the capabilities of the estate, and of the shelter afforded. In any garden these are essentials of the first consideration, for it is far better to be able to assist nature and take advantage of every favourable position as to soil, shelter, &c., than it is to fight against nature and try to accomplish what is well-nigh impossible. Wisley Gardens, open as they are to all Fellows of this Society, should not be merely visited from time to time, but the ideas there carried out should be studied carefully. In this way it would be possible to carry away in one's mind some practical suggestion from each part of it. Note, for instance, in the early spring the lovely effect produced by *Narcissus cyclamineus* in its moist, sheltered situation—one of the gems of the entire garden. Again, the Japanese *Iris* (*I. Kaempferi*) in early July is well worth a visit; this *Iris* is in an ideal spot, and it associates so well with the *Nymphæas* and the *Gunnera manicata* in the background. *Primula japonica* in varied colours, as well as other species of *Primula*, thrive amazingly in the ditches and sides thereof. Farther in the wood are to be found many examples of *Lilium giganteum*, as well as other members of the same genus. I have at no time seen *Lilium giganteum* growing and flowering so finely as at Wisley. Many Ferns are also growing most naturally and luxuriantly in the wood and on the outskirts of it. The Rhododendrons and Azaleas are very fine in their season. I have only enumerated a few of the features in this beautiful spot. The Rock Garden will speak for itself and grow more attractive year by

year. It was not planted for *immediate* effect, hence all the plants have room to grow and establish themselves. It is this type of gardening I should like to see encouraged and extended, and especially the wood gardening. Bamboos are frequently seen in other gardens, but I have rarely seen them so effective as at Wisley. They are planted in an ideal position, open to the west, protected on the east, and as informally as one could desire.

Another garden still quite informal, but of greater extent than Wisley, is that at Leonardslee, Horsham, Sussex (figs. 94, 95,) the seat of Sir Edmund Loder, Bt. When I was allowed to visit this garden last spring I was amazed at the extent, the luxuriance, and the beauty of it, as well as at the wealth of plants. To enumerate a tithe of them would be quite impossible in the time I have at command. What impressed me most was the utter absence of formality throughout. And this is what I want to impress upon others. There are gravel paths, it is true, but they are quite of third-rate consideration, comfortable and safe enough to walk upon, but little trouble to maintain. Rhododendrons of the choicest kinds—some of them hybrids raised upon the spot—are one of the chief features. Azaleas are there in profusion, and so are many species of the Coniferæ, all growing in perfect *abandon*. Now why is this? It is the result of great care, forethought, and discrimination on the part of the proprietor. Before planting, or extending the planting, every consideration was given to the situations and the plants to be dealt with. This has been done to perfection. In another spot hardy Palms, *Trachycarpus excelsus*, and Camellias are equally fine, so also is the Rock Garden, where many unique examples are to be seen. This has been established much longer than the Rock Garden at Wisley, hence it is better furnished, but the whole design is quite informal.

I will now allude to a third example of informal gardening, one that is within the reach of the many. It is that at "The Wilderness," Rev. Shirley, near Croydon, the residence of our energetic Secretary, the Wm. Wilks, M.A., V.M.H. (figs. 82-91). This garden is practically and to all intents and purposes Mr. Wilks's own design. True he did not plant the fine old oaks and other trees, but he so fitted his garden in as to take the fullest advantage of them. The house itself is comparatively new, but it fits in well with the trees and other surroundings. The garden thus appears much older than the building itself. Against the house there is a commodious verandah, then the small but well-kept portion of lawn commences at once and extends a little distance, and then at once begins the wild garden. Upon the lawn, which is kept mown, there are climbing roses grown as specimens, each one well apart from its neighbour (fig. 83). The chief open view is towards the south, with a good expanse on the western side as well, where there is a mixed border of flowering plants next to the house. Both on the eastern and western boundaries there are plantations of trees, chiefly deciduous. When under the verandah there is an entire absence of formality, look where you will. In the wild garden the paths are narrow, but are

kept closely mown. These paths wind in and out to suit the lie of the ground. Mr. Wilks' views, as given to me, are :—

" *Extent.*—The planning of the wild garden must always vary with the extent of its area. A large area cannot be treated exactly like a small one, nor vice versa. At the same time certain points are applicable to all alike.

" *Paths.*—In a wild garden the paths must never under *any* circumstances be of yellow gravel, nor of asphalt or tar, nor of ashes. In open ground they should be grass, kept scrupulously mown. In woodland where grass will not grow they should be the natural soil trodden hard, and the moss should be allowed to grow on it, if it kindly will. In autumn the leaves from trees must be swept up once a week from the grass paths, or they will kill the grass in patches and soon make it unsightly. In woodland the leaves may lie on the paths and will look very natural; the rustling sound as one walks on them is pleasant to the ear, and they are soft to the feet. They should be swept up, say, twice or at most three times from October to March. The paths should follow a more or less natural direction, such as anyone would take, but they should avoid turns at right angles and not be over-serpentine: stretches of straight ahead, followed by gentle curves to right or left, are desirable.

" *Ground Surface.*—The ground should not be dug or cultivated in any way. Presumably the garden is begun by taking in part of a field, and if possible adjoining it should be a small bit of copse, or thin woodland. Each wants treating differently.

" *The Open Grass Area.*—In planting, simply remove sufficient turf and dig a hole, break up the bottom well so as to encourage the roots to penetrate, then throw in the turf and chop it up well with a spade and plant your plant, whatever it may be. And when you have filled in and firmed down, make a sort of small circular bed all round the plant, a few inches away from its centre. Give an ample watering and leave it. If this is done in autumn it will want no more attention (unless it be staking) till March, when, if dry, it should be watered for the first twelve months once a week or so, according to the rainfall, or lack of it. The little surrounding bed should also for twelve months be kept from being overrun with grass. But any plant which cannot take care of itself after the first twelve months' real care is not, in my opinion, a suitable plant for a wild garden.

" *The Grass.*—Let the grass grow all over the field at its own sweet will—only cutting it with sheep-shears just round the newly-planted plants. The grass blossom and the glorious crimson of the sorrel heads will add greatly to the charm of the wild garden. In November and early December, when the autumn-blooming Crocuses are over, the whole of the grass should be cut down with a bagging hook and left where it falls, unless it is wanted as a mulch to newly-planted Rhododendrons and such-like plants.

" *Plants for the Grass Land.*—These will vary according to the nature of the soil. For example, Rhododendrons, Pernettyas, and such-like



FIG. 80 SUMMER HOUSE, THE WILDERNESS, SHIRLEY.
CISTUS IN FOREGROUND



FIG. 27. - WOODLAND PAIR. THE WILDLIFE, SURVEY
THE GROUND EXHIBIT. CAPTIONED WITH IV AND CACUMEN



FIG. 88.—THE WOOD, THE WILDERNESS, SHIRLEY
POLYSCHEIM MOUNTAIN AND P. ACULATUM.



FIG. 89 THE WOOD, THE WILDERNESS, SHIRLEY.
TRIUMPH ROUND THE BASE OF TREES

plants will not be planted in chalky or limy soils. But speaking generally, and following the year round, there will be amongst more or less bulbous plants :—Winter Aconite (these not more than a foot back from the paths), Snowdrops, Snowflakes, Crocuses, Daffodils, *Lilium croceum*, *candidum*, *pardalinum* in wet spots, and *tigrinum*, *Camassia esculenta*, Fritillarias, *Cypripedium Calceolus* and *C. speciosum* in damp spots, Colchicums, *Crocus speciosus*, yellow Water Iris in wet spots, *Iris sibirica*, *Crinum capense*.

“ Amongst flowering plants :—*Trollius*, *Caltha palustris*, Lady's Smock, Lady's Mantle, Forget-me-not in wet spots, all British Orchids, all British Heaths (unless on chalk), Wild Scabious, Wild Centaurea, Blue Alkanet, Viper's Bugloss, Helianthemums, *Salvia pratensis* and its allies, Verbascums of all sorts and kinds, Foxgloves in half shade, Purple Loosestrife, Yellow Loosestrife, Spiræas, *Campanula Trachelium* Ragwort, Golden Rod, Michaelmas Daisies, Ox-eye Daisies, large white Autumn Daisies, *Campanula rotundifolia*, *Inula ensifolia*, *Centaurea macrocarpa*, Marjoram, *Crambe cordifolia*, Mallow (pink and white), St. John's Wort of all sorts, Toad Flaxes, Monk's-hood, Polygonums, Senecio in var., Solomon's Seal, Teasels, Geraniums, Geums, *Anemone Pulsatilla*, Rest-harrow, Betony, Aquilegias, Epilobiums, *Chrysanthemum uliginosum*, *Phyteuma orbiculare*, &c., &c.

“ Amongst flowering trees and shrubs :—Laburnum, Almonds (pink and white), Lilac (only singles), Hawthorns (use the coloured ones very sparingly), Cistus of all sorts, Cytisus of sorts, Double Gorse (not single, it sows itself all over the place, and is not half so beautiful a plant, in or out of flower, as the double), single and semi-double and all Wichuraiana Roses (but none of the show Roses), Guelder Roses, *Forsythia suspensa*, Double Cherries, Osmanthus, Hollies, Tree Ivies, Bamboos, Magnolias, Spindle-wood, Flowering Raspberries, *Spartium junceum*, Cydonia, Rhododendrons (but use the red ones very sparingly), Azaleas, Pernettyas, *Stuartia Pseudo-camellia*, Berberis of all sorts, Lavender, Rosemary, Potentilla (shrubby), *Ribes sanguineum*, Way-faring Tree, Veronicas, Bog Myrtle in wet places.

“ *In the Copse or thin Woodland*.—Encourage Ivy and Moss to grow over the whole of the surface wherever either will do so.

“ *Plants for Woodland*.—Snowdrops, *Anemone blanda*, *A. ranunculoides*, *A. apennina*, and all varieties of *A. nemorosa*—such as *Robinsoniana*, *Alleni*, &c.; *Scilla nutans* and *S. n. alba*; all the Hardy Cyclamen, particularly *neapolitanum*; *Trillium grandiflorum*, Primroses (yellow and white, not coloured), *Campanula latifolia* and *C. l. alba*, *Narcissus cyclamineus* and *N. triandrus*, *Chionodoxa sardensis*, Dog's-tooth Violets, white Wood Violets, *Helleborus foetidus*, Wood Sorrel (white and pink), and Ferns in abundance (the wild British are by far the best, and the curious crested and other forms should be used most sparingly, not more than 1 in 25), such as *Lastrea dilatata*, *L. Filix mas*, *Athyrium Filix foemina*, *Polystichum aculeatum*, *angulare*, and *munitum* (which is Canadian), *Scolopendrium vulgare*, *Polypodium vulgare*, *Dryopteris*, and *Phegopteris* (both the latter in rather damp spots), *Osmunda* in wet places. There

is nothing looks so beautiful in woodland as Ferns. Both for them and for the flowers the wood must not be too dense or too dark. It must be essentially a thin wood. In light soils the Ferns will, in a hot dry summer, want watering once in three weeks, giving a big plant a gallon at a time and a small plant half a gallon, but they are well worth it."

What I admired so much in Mr. Wilks's garden was the way in which all the garden blended in one harmonious whole. In the distance and under the shelter of the eastern screen of trees were the orchard trees—Apples, Pears, and Plums. When in flower these could be nearly all seen from the house itself, and thus add to the beauty of the garden. Quite in the distance I noted a fine row of Scarlet Runners, which added greatly to the effect. Mr. Wilks, I may add, is a most enthusiastic gardener, practical to a degree. In gardening he finds the relaxation and delight so essential to a very busy man.

The garden at East Burnham Park, near Slough—the country residence of Sir Harry J. Veitch, F.L.S., V.M.H., affords another excellent example of fitting in a garden with the surroundings, taking every advantage of the well-grown oaks and other trees. Around the house itself there is an approach to formality, it is true, but as one gradually leaves that behind and arrives at the Wild Garden everything is quite informal, and the utmost use is made of the woodland adjoining. In an open spot are collections of fine foliage plants with some small pools in the foreground, with appropriate water plants, and stepping-stones across and between the pools. On one side are the relics of an old pathway, made with small paving-stones, amongst which are to be seen various dwarf, close-growing plants, Stonecrops and the like. This is quite unlike any arrangement I have ever seen, in every way most picturesque and charming. In the woods are to be seen Bamboos and other plants which thrive in the shade, with the walks quite informal and of such material as can be easily kept clean—thus the one essential of inexpensive maintenance is followed (fig. 92).

Informal Gardens and Old Mansions.—Quite in contrast to many gardens is that of the Lady DuCane at Mountains, Witham, Essex. One, as a rule, associates formal gardens with such houses as hers. This is, however, quite an exception to that rule. I never see, nor have I heard of, a more informal garden than this, or one that is more charming and picturesque. I have had the pleasure of seeing it in various aspects, both in the spring with the Daffodils in their beauty, and later on with the Roses which thrive so well, growing quite in *abandon*, and still later when the herbaceous plants are at their best. In each instance it has been perfectly lovely, like Mr. Wilks's garden in one sense—that of being composed of nearly all hardy plants. No lines are followed, everything being informal to a degree. In the ravine there is a well-arranged Rock Garden, with a little rivulet running through it. Here the Japanese Iris thrives remarkably well (fig. 93). This garden is an example of what may be

accomplished within a limited area when the owner is a keen gardener and takes a real interest in the garden.

My desire throughout this paper has not been to advise curtailment in the garden in any sense, but rather an addition to its beauty and attractiveness by the introduction of a greater variety of plants which are adapted for informal gardening, and may be grown in a more natural manner. All needless labour in upkeep should be avoided, not to reduce the amount of labour expended, but so as to give more attention to the one great essential—cultivation, in such parts of the garden as need real cultivation.

LAWNS AND THEIR UPKEEP.

By JAMES MACDONALD, F.R.H.S.

[Read September 8, 1914; Dr. F. KEEBLE, F.R.S., in the Chair.]

FROM very early times lawns have been subjects of considerable importance. Our own country has always excelled in their culture, and the heritage left by our fathers deserves from us a continuance of the same care and attention which they gave, so that we may continue the pre-eminence they have bequeathed to us. The old lawns scattered about the country in open places and in crowded cities are no mean legacy.

The old gardeners were proud of their lawns—or greens, as they were familiarly called—and instances are frequently recorded of the careful and skilful manner in which they transformed unsightly places into scenes of pleasure. I may mention a reference in this direction by that fine old writer, EVELYN, to a spot near our Hall. He writes: "One needs to go no further to see the effect of this husbandry than to St. James's Park, where, before the Canale, I remember all that pleasant valley now yielding most rich Pasturage (with the fish Decoy and walks planted with fragrant Lime) was nothing but a noisome, unwholesome Bog or Morass of moss and rushes." The gardeners of the past were clever men, and it is due to their ability that there are such fine old lawns in the country.

But, fascinating though the subject of old lawns and their guardians may be, the modern lawn and its upkeep is the theme which most interests us. The lawns of the past were well adapted for the days of chivalry, and the old "gardens with their broad green walks" are being copied very freely by the modern landscape gardener. With the advent of the lawn mower, a great change occurred in the treatment and condition of lawns. The scythe was an implement which required a very considerable amount of skill and concentration of energy, to keep the turf to the required smoothness. With the lawn-mowing machine the work is of a more mechanical nature, and the lawns have suffered accordingly.

The feeble and hoary tale of the Oxford college gardener, who is reputed to have said that lawns required centuries of ungrammatical culture to get them established, has long been exploited. Lawns can be formed in a few years or a few months, according to the skill and energy displayed in the work. One reason why occasional failures occur with lawns is that very little notice is taken of the peculiarities of the soil and situation. If we wish to plant trees or shrubs we generally take care to select varieties suitable for the locality, but with lawns it is sometimes considered that grass is only grass, and very



FIG. 10. *LASTIA DIAVOLA* IN WOOD 17 ft. 9 in. across,
THE WILDERNESS, SHRIEF.



FIG. 91. HARDY FLOWER BORDIER
THE WILDFINNESS, SHIELLY.



FIG. 22. - ALFRED AND WATER GARDEN AT EAST BURNHAM PARK



FIG. 93. —IRIS KAEMPFERI AT MOUNTAINS, WITHAM.

[To face page 77.]

little care is given to the choice of sorts likely to succeed. Not only is this so, but, because grasses will grow anywhere, the preparation of the ground is not always so thorough as it should be.

When it is remembered that the ideal lawn consists of myriads of grass plants, all equally healthy, it will be readily seen that great care is required, to get such a condition of affairs. In making a lawn the local peculiarities have to be carefully considered, and as these vary very greatly it is impossible to give directions that will be alike applicable to all. A practical demonstration in lawn-making is equally out of the question. I will, however, explain how we made lawns at Harpenden this year, and illustrate the work by reference to the figures.

Fig. 96 shows a general view of the turf nursery. The idea is to grow a bed of each of the most useful varieties of grasses, each divided from the others, by a narrow gravel path, so that they can be kept in every way quite distinct. The two ends are treated so as to get the best results in lawn turf culture, while the centre is allowed to grow on, for the variety to develop itself fully. Two spaces near the centre are treated as meadow land. The photographs were taken a little over three months from the date of sowing.

The space selected was partly orchard and partly arable land, with an irregularly undulating surface. The trees in the orchard were carefully rooted out and burnt, and every particle of rubbish cleared away from the arable land. Levels were then taken, and the whole area bastard trenched, taking care to retain the best soil on the top.

Frequently when this stage has been reached the ground is raked over and the grass seed sown. This method may be expeditious, but it is the cause of many failures. The grasses germinate and grow for a time, but in a few months—except in exceptional cases—the finer grasses die away, and only the coarser and stronger varieties remain. If grass seeds are good they may be sown on a ploughed-up furrow, and they will grow and look well for a time, but they will never make a lawn.

Instead of adopting this rough-and-ready method, the whole of the ground was sifted to a depth of about three or four inches. This may seem to some an elaborate system of preparation, but if a good result is desired no detail of cultivation should be considered too much trouble. Besides, it is the cheapest way in the long run. The ideal lawn must possess a perfectly smooth face, covered with a thick, close growth of grass. To obtain this result the sifting was necessary, and after it was done a sprinkling of chemical manure, consisting of 20 per cent. phosphates (mostly soluble), 7 per cent. nitrogen, 10 per cent. potash, mixed with a local preparation, was sown over the ground, and lightly raked in. Now, if instead of sifting the soil to get an ideal surface before sowing the seed, this important detail of cultivation was left until the seed had been sown, and a smooth surface tried to be got by the agency of a roller, the result could not have been nearly so good. There is only one way of getting a good lawn from

seed, and that is the right way. Get the surface perfect before sowing the seed, and the after-process is easy.

In a few weeks, according to the weather conditions, the seeds will germinate, and growth should be rapid. Sometimes a spell of dry weather succeeds the sowing and causes anxiety, but if the ground has been thoroughly prepared, and suitable varieties of grass seed sown, dry weather need cause very little trouble. At such times, if watering is resorted to, the result is almost certain to be anything but pleasing. A dry spell may delay the germination, but that should be all.

Like all other plants, the early days of grasses are times when care and gentle culture are a necessity. As soon as they are sufficiently long and strong to cut, this should be done with a sharp scythe, and the cut grass raked off—not swept, as is frequently the case. In all probability, the mowing will have to be done with a scythe for some time, until the plants have thickened sufficiently for a lawn mower to be used. A common mistake in lawn turf cultivation is to consider that when the grasses have reached this stage they can take care of themselves, if they are groomed occasionally with the roller and mowing machine. They resent such treatment.

At this stage it is most essential to give the grasses suitable nourishment similar to that already recommended, but it must be given very carefully. The advantage of beginning to feed the grasses so early is that the roots are retained on the surface, and a finer, closer growth of grass is developed than if they were allowed to grow on, without this attention. But, in applying the plant food, care must be observed to sprinkle it frequently on favourable occasions, instead of as an annual or bi-annual dressing.

The period in which a lawn, after sowing, may be considered fit for use depends, as has already been mentioned, very much on the treatment it has received (fig. 97). Indifferent preparation of the ground and inadequate attention afterwards can only result in failure. The great defect of seeding by the ordinary method is the length of time before the surface soil is a network of healthy roots, and covered with fine grass, so that it can be walked or played on, without mud being too strongly in evidence. This, by the usual system, will always be a drawback to it being so extensively done as it might be.

For many years we have recognized this disadvantage, and experiment after experiment has been tried to remedy the defect, and at last we succeeded. A fabric is specially prepared, and sufficient suitable plant food incorporated with it, to sustain young grasses for a considerable period. The seeds are sown on this, and when the plants are well started the fabric is transferred to the ground where it is permanently to remain. There are many advantages attached to this method, some of which I will refer to. Assuming, as is sometimes the case, that a structure has been erected—either a new building or an addition to an existing house—the work may be completed at a time when it is impossible to lay down turf, and inadvisable to sow grass seed. In such a case the prepared fabric can

be transferred to the desired place, and give the necessary finish to the work.

Another great advantage of this method over any other is that most weeds cannot grow through the fabric. Anyone who has had experience of a seeded lawn under ordinary conditions knows only too well how troublesome weeds are in the early stages. Being indigenous, they grow with greater vigour than the grasses, and occasion an enormous amount of labour to root them out, at the same time damaging the young grasses very considerably during the process.

Besides these weeds, there are always some native grasses that will grow at the same time as those that were sown, and as these are difficult to discriminate in the early stages they are allowed to grow with the others until their true character is developed, when they have also to be rooted out. Those disadvantages are avoided by this special system, and if a lawn is desired to be exclusively of any one particular kind of grass it can easily be grown under these conditions. One point to be observed when this is desired is that the initial preparation of the ground is such that will suit the particular kind of grass it is intended to grow. For example, the preparation necessary to grow *Festuca rubra* will not answer so well for *Poa pratensis*.

City lawns could be produced more rapidly and more satisfactorily by this method than by the means generally adopted. The great length of time taken by the usual system of seeding in securing a lawn has caused turf in many instances to be introduced from country districts. This is rarely a success, and the reason is not difficult to find. There are but few grasses that will grow well in towns, and these are seldom introduced with country turf. The kinds introduced vary with the district they are imported from, and it is very rare, outside a city radius, to find turf so exclusively composed of Poas as that found within the city boundaries.

The species of *Poa* which are best suited for such places have been a matter of discussion for many years. My experience favours *Poa trivialis* for the more open spaces, and *Poa pratensis* where there is more shade. Where the shade is exceptionally dense, I have used with great success the perennial dog's-tail (*Cynosurus cristatus*). Close to the stems of large trees I have found this to succeed better than any other grass. *Poa annua* is sometimes recommended, but rarely used, no doubt in some measure owing to the difficulty in obtaining the seed.

This, in my opinion, is a wise provision of nature, for, as its name implies, an annual grass cannot be good for a permanent lawn. *Poa distans* is sometimes confused with *Poa annua*, but, although they are in some respects alike, *Poa distans* is a perennial.

TURFING LAWNS.

Lawns that are to be turfed over require very much the same initial preparation as that advised for seeded lawns. The ground

should be deeply and carefully dug as long before laying down the turf as possible, and the surface hoed over on every favourable occasion. Just before laying the turf, the surface soil ought to be sifted to a fine tilth, and well rammed with iron rammers. When this is done so that the ground presents a perfectly even and firm face, the turfing can be commenced.

Now, there are many ways of doing this, but the best method is to cut the turf in squares of a definite size. One foot square is as useful as any that can be suggested. Turf cut like this is easily handled, and is in every respect better than the primitive method of rolling them in lengths of three feet by one foot. However carefully it is cut in such lengths, there are certain to be some irregularities that are detrimental to the accuracy required for first-class lawns. Some who adopt this system will tell you that these irregularities will roll out to the desired smoothness. But even if this could be done it cannot be considered good workmanship, for if a mound is compressed to the level of a hollow there still exist two distinct conditions that will prevent the even growth of grass, which for the ideal lawn is as necessary as the level state of the ground.

When the turfs are cut into the one-foot squares already mentioned, each turf is trimmed to an even thickness. This is done by laying them grass side down on a shallow tray, the depth of which varies according to the thickness desired. The trays need to be made so that the cut turf can slide in and out, but otherwise to fit the turf so that there is no room for movement. Then, with a sharp two-handled knife, cut the underside to the gauged thickness. If the soil has previously been prepared to a firm evenness, the turfs can very quickly be laid down, fitting them closely to each other and presenting, when finished, an accurately dead evenness that requires only thoughtful cultivation.

This cultivation must necessarily vary somewhat with varying soils and conditions. The first thing to do is to give the newly-laid turf a dressing of chemical manure, and after this has been done apply a light sprinkling of finely-sifted soil or sharp sand. The chemical manure induces root growth, which unites the turf together, and the fine soil or sand fills up any joints that may be open. Occasionally at this stage it is well to sow some grass seed, especially if the turf laid down is inclined to be weakly or thin in texture. Very little rolling, if any, is necessary in the early days of the lawn, and when rolling is done the ground ought to be in a fairly dry condition at the time, and only a light roller used. I know this is opposed to a very general practice which consists of using a heavy roller when the ground is wet, so that it may "leave a good impression behind."

Such an impression, however, is distinctly hurtful to the future lawn. All gardeners are aware that it is necessary for the welfare of a plant that the rooting medium should be of an even firmness throughout. No one would expect a plant to remain healthy, or to grow freely, where the surface is too tightly compressed. After all,



FIG. 24.—IN SURF MOUNT LONK'S GARDEN, LEONARDELL.



Fig. 65 -- Tim Pond at Llanvapoch

FIG. 5. THE NURSERY AT HARMONY.





FIG. 97.—CROQUET LAWN ABOUT FOUR MONTHS OLD AT HARPENDEN

To see p. 577.

grasses are plants, although the treatment they sometimes get is sufficient to make one think that they are not always recognized as such.

Where this extensive rolling is persisted in, it generates conditions under which the finer grasses cannot grow, and eventually coarser kinds, weeds, and bare patches take their places. If a lawn has been well made and suitably attended to, very little rolling should be necessary. These conditions must have given to it an even, smooth surface, which can be easily retained with skilful cultivation.

Deeply as I have gone into the matter, I cannot find out the least excuse for the continuous use of a heavy roller on lawns. The most successful cultivator of lawns is the one who works conjointly with nature, which readily responds to gentle culture, but resents forceful treatment.

These later remarks apply chiefly to what may be termed the ordinary lawn. Lawns that are used for such games as lawn tennis need to be treated rather differently. An ideal tennis court should play fast, and be firm and true. To obtain these essentials a greater amount of rolling is necessary than I have previously advised, but this rolling must be done with caution and discrimination. Rolling, that under certain conditions will do good, at other times may do harm. Winter rolling may be placed under the latter category. At this period of the year, or in early spring, it almost invariably does harm, and should be avoided.

Generally lawn tennis is played from May to October. As soon as the period of play is over, the treatment necessary to prepare the lawn for the succeeding season should be commenced. This may consist of re-turfing any very worn-out places with turf of equal texture to the existing material. Then loosen any very severely compressed places with a digging fork, and heavily rake over the whole area. When this is done apply chemical manure according to requirements. It is important that this chemical dressing should be of a nature that will benefit the turf.

The nature of the plant food, and the manner of its application, must necessarily vary very considerably, according to the kinds of grasses that exist, and the nature of the soil in which they are growing. Situation also has a considerable influence on the growth of grass. This can be seen on almost any lawn by comparing the growth on a slope with that on the flat. It is these variations that in a great measure make the cultivation of grasses such an interesting study. I admit a certain amount of enthusiasm on the subject, and after many years of close attention to it I find that the greatest aid to successful culture is observation. Even in the application of food, I find observation of far greater assistance than an analysis of the soil alone.

If one is thoroughly conversant with a plant, it almost tells you what treatment it should receive. Take a Poa or a Fescue, both very important lawn grasses, and examine it. If it is a small contracted specimen, it tells you at once that its emaciated condition is due to

a lack of proper food. If it is a soft, loosely-grown plant with abnormally fleshy roots, it is readily seen that the rooting medium is defective. Now the same treatment applied to both alike will not give a satisfactory result. The weakly specimen needs freer rooting conditions, and frequent light applications of suitable plant food, until it has recovered its normal vigour. The luscious growing plant requires something that will absorb the excess of organic nourishment existing there, and induce a more fibrous and firmer root growth.

Perhaps I can illustrate this better if we examine an undulating putting green on a golf course. The best putting greens are evenly clothed with close, fine grass, which is equally good on both mounds and hollows. The natural tendency of grassy mounds is to get impoverished and hard, so that the rains cannot penetrate, and eventually plant life gets to a low ebb. In the hollows the reverse is the case, and an over-luxuriant growth results. To equalize these growths, distinct treatment is necessary. Very little can be done in this respect during summer, but as soon as the autumn rains have moistened the ground very much can be accomplished. The mounds then need to be loosened rather deeply with a digging fork, and light sprinklings of chemical manure applied occasionally, when the ground is moist. This will strengthen the grasses and enable them to go through the drought of summer without damage. The hollows need frequent light sprinklings of sand or sandy loam, until they reach a degree of firmness nearly equal to the mounds.

If the winter management of lawns has been thorough, the summer treatment is simple and easy. The cultivation they have received has trained the grasses to go through the heat of summer and the season of play. If either the drought is excessive or the play severe, they may get sunburnt or fagged, but they quickly recover after rain. There might occur exceptional cases where watering lawns may be necessary, but generally it is better avoided. The beneficial effect derived from rain is not due so much to the rain itself as to the altered climatic conditions and the dissolved air which accompanies it. Water applied to turf during hot weather causes the grasses to retain their greenness at the expense of their energy.

MOWING.

Mowing ought to be commenced as early in the season as possible ; in fact, it will not require to be stopped at all if the winter is mild. But, assuming that the severity of winter has stopped grass growth, as soon as frost and snow have gone and vegetation reasserts itself mowing should be proceeded with on the first favourable occasion. This is an important detail in lawn-turf cultivation. If, as is frequently done, the grass is allowed to grow so long that it has to be cut with a scythe before the lawn mower can be used, the energies of the grasses are extended in the wrong direction. I have seen lawns allowed to grow until there were loads of luscious grass taken from them,

and the surface that remained was not turf at all, but miniature stubble. If this practice is continued for any great length of time, the erstwhile lawn degenerates into a mass of moss, weeds, and undesirable grasses.

A suitably nourished, healthy lawn cannot be mown too frequently. A run over every day with the lawn mower when the weather conditions will allow—without the collecting box being attached—is not too frequent. By adopting this method of culture the lawn is always ready for any purpose that may be desired. Not only this, but by doing so the energies of the grasses are directed into the right channel. The manurial benefits derived from this practice are *nil*, but the equalized growth obtained by it conduces to make the fine, close, compact growth so desirable on a lawn.

RENOVATING OLD LAWNS.

Sometimes old lawns are ruthlessly dug up because they have got into a bad condition. Before adopting this extreme measure it is well to see closely whether they can be reformed, and unless the turf is too thickly overgrown with weeds I have always found it possible to do so. Where the lawns are very mossy they are generally amenable to cultivation, but this cannot be done by the agency of a garden rake, although it is a practice commonly adopted. It is impossible to rake away moss without rooting out grasses as well, and however closely the teeth of the rake may be placed, they will not clear away all the moss, and generally that which remains grows away with renewed vigour, so that in a short time the lawn is as bad as or even worse than it was before.

In February last we were called upon to improve a shady lawn. At that time it was practically a mass of moss, quite unsuitable for croquet or tennis, for which purposes it was intended. The conditions existing at that time were favourable for the growth of moss, and unfavourable for the growth of turf. Accordingly the moss was first killed with a chemical preparation and afterwards raked off. Then another chemical dressing was applied, to stimulate grass growth. Later on, during April, suitable grass seed was sown where necessary. After that frequent mowing and light rolling were commenced, and have been continued.

This is only one type of the neglected old lawns. They are many and varied, but at a meeting such as this it is impossible to go into the details necessary for their improvement. But they can be improved, and the work is well worth doing.

BOWLING GREENS.

A great expense is frequently incurred in the construction of Bowling Greens and importations of seaside turf which very frequently degenerates. A far less expensive and equally effective method is to sow a good variety of Fescue on ground that has been carefully prepared and

dressed with chemical manure that will retain the roots on the surface. Turf of this description can be obtained in six months from sowing if the weather conditions are favourable. It may be slow at first, but all greens of this nature are in their early stages.

The cultivation of lawn turf is a most fascinating occupation in itself, and if it develops into a study of grasses the work is rendered doubly attractive. Many years ago Professor Martyn wrote : " Grass vulgarly forms one single idea ; and a husbandman, when he is looking over his enclosure, does not dream that there are upwards of three hundred species of grass, of which thirty or forty may be present under his eye. These have scarcely had a name besides the general one until within these twenty years, and the few particular names that have been given them are far from having obtained general use ; so that we may fairly assert that the knowledge of this most common and useful tribe of plants is yet in its infancy."

Some of these words might be re-written to-day.

MECHANICAL STRUCTURES IN THE VEGETATIVE ORGANS OF PLANTS, DEVELOPED IN RESPONSE TO PHYSICAL FORCES, COMPARED WITH SIMILAR ONES EMPLOYED IN ENGINEERING.

By Rev. Prof. G. HENSLOW, M.A., F.L.S., V.M.H.

[Read October 20, 1914, Dr F KEEBLE, F.R.S., in the Chair.]

ANIMAL mechanics have long been observed and described, but vegetable mechanisms have been only incidentally alluded to in botanical works.*

I propose now giving examples of certain mechanical structures in plants which can in several cases be illustrated by like constructions required in engineering, when similar strains have to be met: as in building bridges, in the erection of iron pillars to support heavy roofs, as well as in the construction of levers, boilers, &c.

Purposeful mechanics are to be seen in all organs of plants, viz. roots, stems, and branches; petioles and blades of leaves; floral organs, fruits and seeds.

Resistance to Gravity by Stems.—Any plant which grows above the ground at once "feels" the everlasting "pull" of gravity, and unless the stem can support its own weight, down it must go. Purely cellular tissue, if turgid, may be enough, as in the stems of mushrooms, but in flowering plants this is generally much strengthened by a number of woody, vascular strands, arranged in one or more circles, especially near to the circumference, as seen in a transverse section of most Dicotyledons. KERNER† would compare the isolated bundles of an herbaceous stem to girders, but the objection to this idea is that there is no *stiffening* tissue corresponding to the iron "web" or cross-bar of a girder, connecting the opposite strands regarded as the "flanges." The pith offers a very feeble resistance to bending

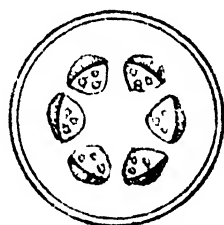


FIG. 98. — ARRANGEMENT OF VASCULAR BUNDLES IN A DICOTYLEDONOUS STEM

* I dealt with some few of the mechanisms of flowers in *The Origin of Floral Structures* (1888), illustrating *Lamium*, p. 126; declinate stamens, pp. 81, 82, 126; and the fruit of the pear, p. 124. A chapter (xiii. p. 123) also deals with the effects of strains on structures. Others will be found in the JOURNAL R.H.S. 1901. Experiments will also be found described under the heading "The Resistance of Plants to Mechanical Strains" in my *Origin of Plant Structures*, p. 203.

† *Natural History of Plants*, p. 724, under the heading "Resistance of Foliage-stems to Strains, Pressure, and Bending."

and a transverse crushing. Fig. 98 (after KERNER) shows three bundles or strands opposite other three; if each pair were connected by a vertical *band* of stiff, woody fibres, then they might represent three girders combined in the centre; but there is nothing of the sort. Moreover, there is no certainty of every strand having another exactly opposite to it. In dicotyledonous stems, as of a primrose, it is usual to find five, which ultimately supply the strands for the floral organs. Of these no two can be opposite one another.

Asking an engineer for his opinion on the point, he said it would be as I have stated; but he added, the stem being filled with pith would more nearly resemble a hollow iron pillar or stanchion when filled with concrete, only the pith, of course, offers no analogy with such a rigid substance.

If the strands are all coherent into a hollow cylinder without any pith, then the latter is clearly not required for support; and we get the tubular form of a grass-stem and many other herbs.

As the wood is formed in response to the strain of gravity, it is interesting to find this "acquired character" is hereditary; for seedlings of trees and shrubs are already "miniature trees," having a complete cylinder of wood filled with pith, though they may be no more than three or four inches in height.

Nature now adopts engineering processes, as the tree grows to maturity. If it has, like the mahogany tree, a tall cylindrical trunk, bearing a great weight of branches and foliage at the summit, aerial roots take on the form of *flat buttresses*. This sometimes occurs with short trunks when the superstructures are of great weight, as in species of *Sterculia*. They sometimes resemble "flying buttresses," when there is a hollow space near the base.

A similar method of supporting wrought-iron columns is adopted by placing iron plates, called "gussets," vertically against the base of the pillar. The pillar may be square or polygonal. The pillars are finally riveted to an iron "bed-plate" on a foundation of brick-work. So, while the "gussets" resemble the root-buttresses, the "plate" might be compared to the spreading horizontal roots in the soil. Moreover, sometimes the superficial roots get united by fusion (as in *Phytolacca*). This may sometimes be seen in our elm trees, when the roots are exposed on a bank. Such would presumably strengthen them in supporting the trunk. Though it seems to be an accidental occurrence, it may be compared with the "bed-plate" for iron columns, mentioned above.

Pile-roots.—In all Monocotyledons and aquatic Dicotyledons, the original primary, axial, or tap-root is suppressed. Secondary "adventitious" roots arise from the nodes of the stem. When formed in the air, they somewhat resemble tent-ropes, as seen in screw-pines (*Pandanus*).

Aerial roots can descend from the branches of certain trees, as of the banyan or Indian fig, in land, and from those of mangroves over water. Similarly pine-trees growing in sandy soil send out long

horizontal roots just below the surface, while pile-roots descend vertically from them underground. They are often exposed when a cutting is made for a road, as in Bournemouth.

Roots of dicotyledonous trees, of course, supply the main sources of resistance to the wind. They usually run more or less superficially and horizontally in open ground; so that, whichever way the wind blows, the roots on the same side afford a powerful "pull" against it. But, if a tree grows on the edge of a steep bank, one or more roots run vertically downwards on the exposed side, while others lie more or less obliquely, penetrating the adjoining field. The former would be pile-roots, resembling the piles supporting a pier, one end of which is on the land.

Upheavals by Leverage.—What may be called "imitative" pile-roots may often be seen, but these are due to the exposure of originally subterranean roots, by their being elevated by the leverage through the power of growth and the resistance of the underlying stratum.

Sir J. D. HOOKER, in his "Primer of Botany," observes: "In tropical countries the destruction of buildings is often caused by the power of growing roots; and neither conquering nations, nor earthquakes, nor fires, nor tempests, nor rain, nor all put together, have destroyed so many works of man as have the roots of plants, which have insidiously begun their work as slender fibres." *

All such exhibitions of force are the result of leverage, in which the energy of the roots growing downwards is more or less arrested by the obstruction of the soil or rock. It is then diverted into a lifting power, the resistance of the rock being the fulcrum. Trees may often be seen with the upper parts of their roots exposed. This is the result of their lifting power. It is a common thing to see a wall, near which a tree is growing, cracked from top to bottom by the same cause.

The Mechanism of Roots.—As a strain upon a root partakes of the nature of a "pull" rather than lateral pressure, this is met by the whole bundle of mechanical tissue being developed in the middle, the pith being almost or entirely absent. Besides wood-fibres, sclerenchymatous tissues may be developed besides a strongly thickened endoderm.

Cylindrical Stems devoid of Pith.—Many cylindrical and hollow stems are comparatively slender and weak, as straw and bamboo stems. These have to resist the lateral pressure of the wind. The first additional structures are the diaphragms placed at intervals at the "nodes," composed of strong woody strands crossing from one side to the other. This method is not usually imitated by engineers; for to unite sections of iron tubing a flat but ring-like piece of iron is placed between the two ends, these being provided with flanges, which are then riveted to the ring between the latter, the whole being surrounded by plates, called a "collar." This may be compared to

the thickening at the joints of a tubular stem in which the transverse diaphragm is not completed, as in some umbellifers. In the case of iron tubing, the entire length is subsequently filled with concrete.

The diaphragm is more or less cup-shaped, or in the form of an inverted cone. This is the strongest mechanical arrangement for resisting the tendency to tear the internode above it. For the "pull" upwards, if the wind is trying to break it across, is met by a corresponding pull downwards. The force is thus neutralized, if it can resist the strain.

Another method of strengthening an iron angular column is by the addition of "angle-irons" at the corners, to which they are adapted inside. This corresponds to the collenchymatous strands of the four corners of the quadrilateral stems of *Galiums* and the dead-nettle.

The common heath-grass (*Molinia*) shows an additional method of supplying strength, though hollow in the centre, namely by a zone of strong fibrous tissue in which the vascular cords are imbedded.

Mechanics of Climbers.—Tropical woody climbers or lianes are particularly interesting in consequence of the various mechanical contrivances adopted to enable them to resist the enormous strains to which they must be submitted, as well as their own weight. A simple case is seen in the genus *Bauhinia*. The stem at first is normal or cylindrical, but it soon becomes flattened by a greater growth being made along one diameter. It then becomes ribbon-like and more or less flexible, but strong. It also introduces the "cup or arch" mechanism on alternate sides; so that every cup or arch stands in the bases of two others.

The horizontal force of the wind or other strain acting laterally at any point is effectively met and neutralized in a similar way to that of the cup-like diaphragm of the bamboo.

A corrugated iron sheet is made on much the same principle, so that if a transverse strip be cut off it would be something like the stem of *Bauhinia*, only the surface being simply flat instead of "cupped." Of course the corrugated or "arch upon arch" structure, as it might be called, adds materially to the strength of sheet iron in resisting strains. Sometimes a long brick wall for fruit trees is built in a series of curves or a sinuous manner. It can then be made of less material than a straight wall would require.

In the gigantic climber called the "monkey-ladder" (*Caulotretus*) the same kind of mechanism exists, but additional strength is acquired by flanges being added to the edges of the stem. These, of course, greatly stiffen the stem and make the whole more rigid, like a girder.

Two more examples of "corrugations" may be mentioned. Boiler flues (within circular tubes) are made with a succession of rings and depressions, the object being to produce greater strength to resist the pressure of steam within them.

Bridges &c. are often built on a series of angular arches of iron, each arch being in the form of a "frustum," or truncated cone, or pyramid, erect and inverted successively. Great strength is thus acquired for

carrying heavy trains, &c. They thus resemble the alternate "cups" of *Bauhinia*.

A totally different principle is introduced in the cable-like lianes. The stem develops a number of superficially projecting rod-like ridges. If the whole stem be now twisted, it closely resembles in appearance a cable of separate strands twisted together. If a piece of string be held taut, but twisted by the hand at one end, and then slackened, the force put into it must be met. To do this, the string instantly twists upon itself until equilibrium is established. This twisting also takes place in Nature, as in some Malpighiaceae lianes. There is much superficial resemblance to wire cables; but in the latter the wires are all separate.

Tendrils.—One of the most curious methods of strengthening a tendril is seen in the Cucurbitaceae and Passion-flower. In the Bryony and other members of the Cucumber family, the tendril is at first very long, straight and stiff, with a hooked tip. As soon as the latter has caught hold of, and coiled two or three times round a twig (for it is highly sensitive to touch), it begins to bend at some point and forms a loop with somewhat straight sides. This loop then rotates, and the result is that the tendril coils in opposite directions on either side of the straight loop or "crank," as it might be called. As a rule, there will be the same number of coils either way. Sometimes a second or third crank is formed, presumably as strains are felt, which must be guarded against, so as to avoid any rupture of the tendril. This crank-like motion does not appear to be known to modern botanists generally. Neither Darwin nor Sachs alludes to it. Darwin's figure in his "Climbing Plants" (p. 165, fig. 13) of the tendril of the Bryony is not quite accurate, as will be seen by comparing it with "true" cranks as taken from Nature. An interesting article on the action of the tendril of a gourd, describing this process of coiling round a pencil hanging freely, and then producing a "crank" to produce opposite coils, will be found in "Harper's Magazine," July 1907, p. 296, with illustrations. The author is Mr. H. T. SHANNON.

M. LÉON, as far as I know, was the first to make observations on the method of reversal of the coils of the tendrils of Cucurbitaceae, *Passiflora*, &c. (*Recherches nouvelles sur la cause du mouvement spiral des tiges volubiles*, par M. T. Léon. *Bull. de la Soc. Bot. de Fr.* 1858, p. 680.) He says:—

"I have looked to see how the coils become reversed. Having observed that they are formed only after the extremity of the tendril was fixed to a support, I placed the end of a tendril of a melon-plant in contact with an object fixed in the soil, and by an attentive examination I made certain that the reverse coilings were simultaneous. The tendril first curves itself in a certain part, and this curvature tends to become pronounced, to form even a semicircle. This arc of a circle then becomes the centre of a rotary but very slow movement, which insensibly twists the tendril on the two sides of this arc, so that each side describes a spiral, in an opposite way."

Another but a totally different use for this crank-action seems to be seen in the poplar, when forming a gall for a certain insect. This insect punctures and lays an egg in the flat middle part of the petiole of a leaf; and to judge by the figures given, it would appear that this part of the petiole revolves twice. The two closely-depressed coils swell up to make the gall, so that it would seem both from this and Mr. Shannon's experiment with a freely hanging pencil, which could give no "purchase" to the tendril, that to be fixed at both ends is not necessary in order to produce the rotatory motion.

The Breaking Strength of Tendrils.—Mr. W. D. Brush, in writing on this matter,* says that tendrils exposed to *tension*, and also having formed contact with a support, had a much higher breaking strength (1007 grammes average) as compared with tendrils in contact only (651 grammes) and free tendrils (190 grammes).



FIG. 99.

Tension certainly increases strength of Tendrils, sometimes by as much as 50 per cent. in the middle third of the length. By radial pressure (obtained by a mercury column in an india-rubber tube enclosed by the tendril), an increased breaking strength was obtained (990 grammes as compared with 727 grammes). Contact, pressure, and tension all increase the breaking strength.

Responsiveness to Force.—The question has been raised whether these mechanical adaptations arise in consequence of, *i.e.* in response to, various pressures, strains, &c. This was Darwin's view, for he describes and illustrates several cases of climbing plants, as Bryony, *Solanum jasminoides*, vine and *Ampelopsis*. In all cases, the climbing organ alters its structure *only after* having caught some object.†

Mr. HERBERT SPENCER found from Mr. CROUCHER's experiments with *Cactus* that it developed wood where it was subjected to artificial strains; but when it was tied up no formation of wood took place.‡ This corresponds with my own experience with cucumbers trained against a wall. The stems and shoots being tied to horizontal wires, the tendrils entirely refused to act. They would neither cling by the terminal hooks nor form coils at all.

This loss of the power to climb without the stimulus is not uncommon. Mr. HEMSLEY, describing *Sphaenocodon obtusifolium*, a native of tropical Africa, where it has a dwarf habit, and is sub-erect,

* *Bot. Gaz.* June 1912, pp. 453-477.

† *Climbing Plants.*

‡ "On the Circulation and the Formation of Wood in Plants," *Trans. Linn. Soc.* xv. p. 405, 1866.

remarks: "But the cultivated plant shows a tendency to twine. It is possible that it has lost the twining habit, so common to the Asclepiadaceae, through change in environment in some of the districts where it has been collected."* The same remark may be made of our sea-side *Convolvulus* (*C. Soldanella*), which grows in the sand, and is rarely known to climb. Dwarf French beans are in the same condition.

The reader will find in my book † how experiments have proved that plants at once respond to artificial strains, and put on mechanical supportive tissues to resist them.

The climbing habit is easily acquired in forests and shady places, as both FRITZ MÜLLER and Prof. WARMING state. The celebrated surgeon J. HUNTER observes if "a bean be weakly, as when grown in the shade, if a stick is put into the ground close by it, it will twine



FIG 100.

round it in loose spiral turns." ‡ I have proved this to be true by experimenting with the periwinkle growing in almost total darkness.§

Leaves.—Supporting mechanisms are to be seen in both the petioles and blades of leaves. As a broad blade has to be extended at right angles to incident light, it is obvious that it must be supported, and as the leverage is of the third kind, the fulcrum being the place of attachment to the branch, the weight acting from the centre of gravity of the blade, the power resides in the petiole. Here, therefore, must be the greatest point of strength, just as it is in a bough of a tree and in declinate stamens.

The petiole is so constructed as to secure this leverage. The vascular bundles may be in a circle, just as in the stem (maple), but more usually it has at least three, the largest being below, and two smaller ones above, as Darwin figures them in *Solanum jasminoides* in his "Climbing Plants." His figures are here reproduced (figs. 99 and 100 A and B). His description is as follows:—"The flexible petiole which has clasped an object increases much in thickness (fig. 100), and its structure is greatly changed. The ordinary state of the petiole is represented by (A). In the section of the petiole (B), which had clasped a stick for several weeks, the two upper groups of fibres had much increased, the semilunar band below has been

* *Bot. Mag.* tab. 7925.

† *The Origin of Plant Structures*, p. 204 ff., 225.

‡ *Memoranda of Vegetation*, p. 7.

§ *Heredity of Acquired Characters*.

converted into a complete ring of very hard, white, woody tissue. The three groups of vessels now form a complete cylinder, but thinner above than below, closely similar to that of the stem."

The upper surface of petioles is frequently more or less concave. The edges thus form flanges producing a structure similar to the stays of Fox's umbrellas. It is characteristic of large leaves, as of the Umbelliferae. By extending the flanges round the stem, a complete sheathing base is secured. This is particularly characteristic of palms, so that the petiole may have more "purchase" in supporting the sometimes enormous weight of the blade.

With regard to the arrangement of the supporting "ribs" and "veins" of a leaf-blade, no one can fail to see how they are distributed to the best advantage, so as to support the extended surface for the sunlight. But leaves thus displayed are subjected to strains by the wind, which they must resist, and to avoid laceration transversely the midrib and lateral veins are so distributed as to secure the greatest strength. It will be noticed that the veins stand at acute angles, from the midrib, so that if a line be drawn transversely it falls across, it may be, from four to six veins besides the midrib.

If the veins are at right angles less strength is secured. As a consequence, the leaves of bananas are always tattered by transverse tearings from the edges to the midrib.

One method of obviating the chance of tearing is to break up a simple leaf into a compound one; when that is the case, the midribs of the leaflets stand at right angles to the main rib, as in a rose. Another advantage seems to arise. In a simple leaf the petiole is just long enough for its requirement, but when it becomes a compound leaf, as is easily seen in a blackberry or raspberry, then the petiole elongates and is able to carry from three to five or seven leaflets. The further advantage of less obscuration of light for the underlying leaves is secured, as well as the total area of the blades being far greater than that of one only.

PERPETUAL-FLOWERING CARNATIONS IN POTS.

By W. H. CUTBUSH, F.R.H.S.

[Read November 17, 1914 : Dr. F. KEEBLE, F.R.S., in the Chair.]

THE chief reason for growing Carnations in pots or in any other manner is usually to obtain large quantities of good flowers for cutting, and it is this object I have in view in writing this paper.

In order to begin at the earliest stage, I have started right from the time the cuttings are taken.

There is considerable difference of opinion as to which is the best time to take cuttings ; some growers prefer autumn, and some spring. Undoubtedly the autumn-struck cuttings make the larger plants, but it is not always possible to get good cuttings, and in some districts, especially in the north, it is difficult to keep the young plants soft and growing during the dull months—a most essential point, for once the young plants get hard it is not easy to get them to break into growth again, especially after stopping ; but whether autumn or spring cuttings are used all should be taken by the end of March, and earlier if possible.

I prefer to root the cuttings in washed sand, either in pots or in a cutting frame in the propagating-house, but on no account have a light on the frame. There should be a gentle bottom heat to the frame. A simple manner, where room is not a consideration, is to put a single cutting into a thumb-pot and plunge the pot to the rim in coconut fibre. This method saves the chance of breaking the young roots at potting time. Short-jointed cuttings should always be selected, and free side-growths make the best. In selecting the cuttings, care should be taken to take them from the healthiest plants only, and from those with the best-shaped flowers. This ensures keeping a good type of the variety, and even improves the type. Great care must be taken in watering the cuttings. A good watering when first put in should be given, after which water the sand and not the cuttings. If the bottom-heat pipes run in a water-tank or have troughs on them it is seldom necessary to water after the first good watering. They should be shaded from hot, bright sun, but on no account should the shading remain constantly on, and it should always be taken off at night. The cuttings must not lie about before putting them in the sand or they will dry and not root. The sand should be about 6 inches deep, and the cuttings dibbed into it firmly in the frame. Never use the same sand a second time.

As soon as the cuttings have rooted—which is in from three to six weeks—they should be potted singly into 2½-inch pots, great care

being taken when lifting them from the sand to avoid breaking the young roots. Pot in a compost which I give at the end of the paper for first potting. One crock only is necessary in each pot at this potting, and the soil should not be over-firm in the pots. As soon as potted, stand the plants in a nice growing-house with a day temperature of 50° and keep them growing, and on no account allow the plants to get hard; one sees so much young stuff ruined at this stage owing to the plants getting over-hard. At the same time do not keep a moist heat, or put on too much heat, and get the plants weedy.

When the pots are beginning to get filled with roots and the young plants are growing, but not before, say about three or four weeks after potting, they should have their first stop by pulling out the centre at the fourth joint above the pot. This is best done by taking the pot in the left hand, holding the stem with the first finger and thumb of the same hand at the joint required, and pulling out the centre with the right hand.

As soon as nice young growths are being made after the stopping, but not before, the next potting should be done. If they are autumn-struck cuttings use large 60 pots, and then pot them an extra time later into 54s or 48s; if spring-struck cuttings, use a 54 pot, or, if strong enough, a 48 pot, a compost as suggested at the end of the paper for the second potting being used. At this potting crock the pot with a large crock in the bottom and five or six small pieces.

Still keep the plants growing, and at this stage it will be necessary to put a small stick to each plant, about 6 inches long, and give a tie.

Stopping must still be continued as soon as sufficient growth is made, in the same manner as described before.

In May the final potting should be done—putting those which are in 54 pots into 32 pots, and those in 48 pots into 24 pots—using the compost at the end of the paper for final potting. The drainage is most important, so at this potting use a big crock covered with small ones to a depth of an inch or an inch and a half.

The plants may now be put into their summer quarters, which may be either a cold airy frame, cold house, or a coal-ash bottom in the open. If the district is not a damp one, but is a nice dry, open country, and not in or near a town, the open is best; but if it is damp, near a river, or in or near a town, then either the cold house or the frame is better, and in a very wet summer this is the better plan.

Stopping should be continued until sufficient breaks have been made about the end of July; but if very early flowers are wanted it must be discontinued earlier, and in some varieties earlier than others. Much depends upon how the plants have grown and at what time the first flower is required as a guide to the last stopping.

Watering should always be done with care, and never over the head of the plant. At no stage should the soil become water-logged. It is better to keep rather on the dry side than to overdo the use of the water-can, but when the can is used give a good watering and not a

sprinkling, for once the middle of the ball gets dry it is difficult to get it wet again.

Should red spider appear, especially during the summer, spray with spisol, taking care to get it to the underside of the foliage; and should the first application not kill it, repeat again in about three or four days. Thrips is also troublesome, and is encouraged, as with other plants, by an over-dry atmosphere. It is most difficult to check once it gets well hold of plants, but, like red spider, it can be killed by frequently spraying with spisol.

At the end of August, or early in September, the plants must be put into their winter quarters. These should be well ventilated, light, and airy houses, all the air possible being admitted to the house and gradually reduced as the weather becomes wet, dull, and cold, but no heat is necessary or advisable at first.

Before taking the plants into their winter quarters they should be cleaned from all dead leaves the surface of the soil cleaned, and each plant staked with a firm bamboo cane about 2 to 3 ft. high, according to the variety, and either looped up with raffia or with a wire ring support.

The houses should be thoroughly washed and cleaned out, and all woodwork, if not fresh painted, should be washed with paraffin soap, and every possible means taken to kill all fungus and insect life. The stage covering should be taken out, and fresh covering put in; or, at least, it should be thoroughly washed if it is to be used a second time.

A sprinkling of Carnation manure can be given at this time on the surface and repeated once a month during the winter till March, when it should be increased to once a fortnight. Use about half a teaspoonful on a 24 pot.

The pots should not be stood pot thick on the stages, but allow always at least one inch to two and a half inches between the pots, according to the variety and the size of the plant.

The staging should be good yellow deal boards or slates, with sufficient opening between the boards to allow the water to get away, or, in the case of slates, a slight fall to run the water off. A covering of shells or granite chips should be put over the stage, about half an inch thick. These make good drainage, and, at the same time, hold sufficient moisture to keep down red spider. Some growers prefer no covering on the stage, but in hot, dry weather this is very liable to cause red spider. During the winter months the stage should be kept as dry as possible, otherwise the accumulation of water will encourage the dreaded Carnation rust.

There is a great difference of opinion as to the most suitable house for Carnations, but recent years have proved that a good, light, airy house, with the plants not too close to the glass, is the most suitable built, if possible, with drip-bars to conduct the moisture or condensation to the side of the house instead of dripping over the plants. Good wide glass, at least 18 inches, will help to give the maximum amount of light, one of the most essential features of Carnation-growing.

When wet and damp weather does set in, the fires should be started and the pipes kept lukewarm, or just sufficiently warm to dry up the damp, the top ventilators being left open day and night. This can be continued until sharp frost sets in, and even then on all possible occasions; a damp, close atmosphere does more harm to Carnations than any other condition, encouraging rust, spot, and nearly every ill they are subject to.

Watering must now, as always, be done with care; keep rather on the dry side than the wet, and do not splash the water over the stage and house.

Fumigation should be attended to from the earliest stage; never allow any insect pest, such as greenfly, to get a chance of doing harm.

A question constantly asked is: What will cure Carnation rust? I admit I do not know a cure which is certain, but many preparations claim to do so, and the answer to the question must be: "Prevention is better than cure." The prevention is, I am certain, *do not keep a close, damp atmosphere.*

The glass of the house must always be kept clean in winter; it is essential to get all the light and sun possible during the autumn, winter, and early spring months. Shading is seldom necessary before April, and then should only be used in hot, bright times. Roller-blind shading is, therefore, preferable to any fixed kind of shading.

Disbudding is often necessary—with some varieties more than others—especially between early autumn and Christmas; after Christmas the buds usually come singly. All buds, except the one main bud on the flower-stem, should be rubbed out in a similar manner to disbudding Roses or Chrysanthemums; and also any lateral growths on the flower-stem. If these lateral growths are not taken away, only very short flower-stems are obtainable and the flowers will be small. Many varieties, however, require no disbudding; they have very long, naturally clean flower-stems, with only one bud.

Another question is often asked: Can two-year-old plants not be used with advantage? My opinion is they are not profitable; the flowers are always small; but they certainly give a large number of flowers. If it is decided to use the two-year-old plants, they should be cut back in July or August, taking out all old flowering wood, leaving all the young growths required to make a good plant. They should be re-potted into a size larger pot at the same time as they are cut back, using the same soil as for final potting of the young plants.

To sum up the whole question of growing Carnations in pots:—have and keep everything perfectly clean; never over-water, and never let the plants get dust-dry; keep the atmosphere dry with a circulation of air; use good and suitable soil; keep an eye on all insect pests; destroy plants with rust or keep them in a separate house as far away from clean plants as possible; and always remember Carnations must have plenty of light.

Potting Composts.

First potting into 2½-inch pots :—Good fibrous yellow loam, 2 bushels. Sand, ½ bushel. Lime rubble or burnt clay ballast, ¼ bushel. All passed through a ½-inch sieve.

Second potting as in first potting above, but half the sand and half the lime rubble.

Third or final potting as for the second potting, but not sifted, and add a 5-inch potful of bone dust and ¼ bushel well-decayed stable manure passed through a ½-inch sieve.

AN AMATEUR'S EXPERIMENTS IN APPLE-GROWING IN THE MIDLANDS.

By G. O. NICHOLSON, F.R.H.S.

IN January 1898 I laid out and planted as an experimental orchard a piece of land about 600 square yards in area, with 32 well-known varieties of apples—two of each—and since 1901 I have kept careful notes of the crop borne by each variety, and of the character of the season, and I now place my experiences on record, as they may be of some use to other amateurs.

The ground consisted of part of an old pasture, and it was prepared for planting by bastard trenching to the depth of about 20 inches, the subsoil being heavy yellow clay. The situation faces south-west, and is fairly well protected from north and north-east winds; the land falls slightly from north-east to south-west, having a natural outfall for drainage in that direction through the existing land drains. The elevation is about 350 feet above sea-level, as indicated on the Ordnance Survey Map, and the district is South Leicestershire.

The trees I planted were maidens grafted on Paradise stocks; all being dwarf bushes (except six standards), they were planted 9 feet apart in parallel rows and came into bearing in 1900, but I did not begin to keep any record of the crops borne until 1902. The trees received no special treatment or manuring at the time of planting or since, but they have been thoroughly cleansed once in three years with Woburn winter wash during the winter months and also an occasional grease banding. They are now in their prime, are in a clean and healthy condition, and bear regularly, with the exceptions hereafter noted. They entirely fill the ground, and have to be kept from overlapping by annual prunings. I have not been troubled much with the usual pests. Signs of American blight have occasionally appeared, but I have taken care to check this at once by an application of paraffin; a few of the trees have shown signs of canker, particularly 'Red Astrachan' and 'Ribston Pippin,' but not to any great extent. The strongest growers and most reliable bearers have been 'Bramley's Seedling' and 'Warner's King' amongst kitchen varieties, and 'Irish Peach' and 'Worcester Pearmain' of the dessert varieties; the only weak grower is 'Stirling Castle,' but I am inclined to think that this is owing to the trees being somewhat weak samples.

In the appended Tables it will be seen that of dessert varieties only two out of ten produced small crops in more than five years out of thirteen years, and in kitchen varieties only one out of seventeen varieties during the same period.

The following is the list of varieties planted, with notes of their cropping &c. arranged as near as can be in order of merit, as far as my experience goes :—

DESSERT APPLES.

1. Cox's Orange Pippin.—Has cropped very well and regularly, but does not colour as well as it should do, and the fruits are rather small.

2. Worcester Pearmain.—Quite the most reliable cropper of the dessert varieties, but lacks flavour and is somewhat tough in eating. Does not keep well, but any surplus finds a ready sale owing to its handsome appearance when well ripened.

3. Irish Peach.—First-rate in cropping and flavour, but has to be eaten or disposed of almost before it is ripe, as it will not keep at all, and if left on the tree is soon spoilt by the birds or wasps.

4. White Juneating.—A steady cropper, but of small size and juicy but of poor flavour. Very early, being usually fit to eat in August. Does not need gathering, as it drops when ripe, if not before.

5. Devonshire Quarrenden.—A little uncertain, but very good at its best, and has proved a fair cropper and keeps well for a mid-season apple.

6. Red Astrachan.—Good cropper, but trees canker rather badly. Fruit of attractive appearance and good flavour, but will not keep, and deteriorates in flavour very rapidly.

7. Lord Burghley.—Uncertain bearer, but is very good occasionally, is of good flavour in a good season, and keeps well.

8. King of the Pippins.—Uncertain and disappointing, and keeps badly. An attractive apple in appearance, but not of first-rate flavour or texture.

9. Ribston Pippin.—I have had very little success with this, and the present year's crop is the best I have ever had, both in quality and quantity. Probably my land is too cold and damp for it. The trees grow and spur well, but are inclined to canker and drop the fruit before ripe. It is worth growing, of course, on the chance of getting a good crop even once in twelve years.

10. Blenheim Orange.—Makes too much growth, crops badly, and goes mealy if kept. Too strong a grower for a pyramid

KITCHEN VARIETIES.

11. Bramley's Seedling.—This easily stands first, both in the growth of the trees and for the quality and quantity of the fruit borne. If well ripened and carefully stored it makes excellent eating after March. My trees scarcely ever produce any small or blemished fruit, and the finest are very handsome and full-flavoured samples.

12. Warner's King.—This has cropped regularly and heavily, but has one drawback, as it keeps badly, and however carefully gathered and stored it develops a curious decay under the skin early in

November. If used in September or October it is of excellent flavour, and is the best baking apple grown by me. The growth of the tree is regular and very strong.

13. Lord Grosvenor.—Uniformly a good cropper and of brisk acid flavour. It is the best early cooker, but it keeps badly.

14. Ecklinville	} Very similar in character. Both crop well and regularly, and are of a good average size ; neither keeps very well, but they are good market varieties and command a ready sale.
Seedling.	
15. Potts' Seedling.	

16. Lord Suffield.—Not a heavy cropper, but of excellent flavour, and a first-rate mid-season cooker.

17. Frogmore Prolific.—Well deserves its name, but is of poor flavour and keeps badly, so I cannot recommend it except as a very productive variety ; is occasionally badly scabbed.

18. Cellini.—A good cropper and an attractive apple, good cooker but too sharp in flavour for dessert. Bruises very soon, decays easily in a wet season, and is a poor keeper.

19. Dumelow's Seedling.	} Uncertain in bearing, but of good flavour, and both keep well.
20. Newton Wonder.	

21. Stirling Castle.—Good cropper but does not grow freely. Fruit of good flavour and keeps fairly well.

22. Beauty of Kent.—Uncertain bearer, but of good size and flavour when quite ripe, and almost good enough for dessert.

23. Lane's Prince Albert.—Very uncertain and does not do well with me, but is of good flavour and keeps well when I have a crop at all. Possibly my trees are not true to name, as I have seen much handsomer specimens elsewhere.*

24. Alfriston.	} Both crop well, but their flavour is poor and rather woolly if kept.
25. Hambledon DeuxAns.	

26. Peasgood's Nonesuch.—Grows a great size and is of beautiful shape and colour, but lacks flavour and has to be disposed of at once, as it deteriorates very rapidly if stored.

27. Queen Caroline.—Has grown well, but I cannot recommend it either for flavour or its keeping qualities.

Five other varieties were included in my original planting, but have since been discarded for various reasons, viz. :—

Hawthornden.—Cropped heavily and regularly, but was usually scabbed and kept very badly.

Duchess of Oldenburg.—Though strongly recommended to me, I found it of poor flavour, a bad keeper, and easily bruised.

Mr. Gladstone.	} Were all of poor flavour and quality. I am inclined to think that the two former were not true to name.
Wyken Pippin.	
Red Juneating.	

* Mr. S. T. WRIGHT, of Wisley, informs me, since this was written, that they are the variety 'Seaton House.'

Table Varieties.		Crop—Good, Medium, or Small										Totals of each Variety.	Notes on Growth &c.			
No.	Year	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911			1912	1913	1914
1	Cox's Orange Pippin	S	M	G	M	G	S	G	G	G	G	S	G	S	{ 7 M 2 M 4 S	Nice even growth; wants regular pruning.
2	Worcester Pearmain	G	M	G	G	G	G	G	M	M	G	G	G	G	{ 11 G 2 M 8 S	Straggling growth requiring thinning, not pruning.
3	Irish Peach	S	S	M	G	M	G	M	G	G	G	G	G	G	{ 8 G 3 M 2 S	"
4	White Juneating	S	S	M	G	G	G	G	G	S	G	G	G	G	{ 9 G 1 M 3 S	Stands pruning well Average growth.
5	Devonshire Quarrenden	S	S	M	G	M	M	M	G	S	G	S	G	G	{ 5 G 4 M 4 S	"
6	Red Astrachan	M	S	G	G	G	G	S	G	S	G	S	S	G	{ 7 G 1 M 5 S	"
7	Lord Burghley	S	S	M	M	M	M	M	G	S	G	S	G	M	{ 3 G 6 M 4 S	"
8	King of the Pippins	G	S	M	S	S	G	G	M	M	G	S	M	S	{ 5 G 3 M 5 S	"
9	Ribston Pippin	S	S	S	S	S	S	S	S	S	S	M	M	G	{ 1 G 2 M 10 S	Growth very free, wants heavy pruning
10	Blenheim Orange	S	M	G	S	M	S	S	S	S	S	S	S	S	{ 1 G 2 M 10 S	"
Totals for each year		20	45	45	45	45	45	45	45	45	45	45	45	45		
Totals for each year (Good Medium Small)		11	35	22	44	32	33	33	26	2	2	6	2	3		

Kitchen Varieties.		Crop—Good, Medium, or Small.											Notes on Growth &c.			
No.	Year	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	Totals of each Variety	
11	Bramley's Seedling	M	M	G	G	G	M	M	G	S	G	S	M	M	5 G 6 M 2 S	Very free and strong grower. Little pruning required
12	Warner's King	G	M	G	G	G	G	G	G	M	G	G	G	G	11 G 2 M	"
13	Lord Grosvenor	G	G	G	G	G	G	G	G	G	G	G	G	G	13 G	Growth regular, but not too free.
14	Ecklinville Seedling	G	M	G	M	M	G	M	G	G	M	S	M	G	6 G 6 M 1 S	"
15	Potts' Seedling	M	M	G	G	G	G	G	G	G	M	G	M	G	9 G 4 M	"
16	Lord Suffield	G	S	G	G	G	S	M	M	G	M	G	G	M	7 G 4 M 2 S	"
17	Frogmore Prolific	M	G	G	G	G	G	G	M	G	G	G	G	G	11 G 2 M	Strong grower, but needs pruning well.
18	Cellini	M	G	G	M	G	G	G	G	S	M	M	M	G	7 G 5 M 1 S	Average growth and pruning.
19	Dumelow's Seedling	G	M	G	M	G	M	M	G	S	M	S	S	S	4 G 5 M 4 S	Good and strong grower.
20	Newton Wonder	M	M	G	G	G	G	M	G	G	G	S	G	S	8 G 3 M 2 S	Average growth and pruning.

Kitchen Varieties.		Crop—Good, Medium, or Small.												Notes on Growth &c.		
No.	Year	1901	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	Totals of Varies	
21	Stirling Castle	G	S	G	M	G	G	G	G	G	G	M	M	G	19 G 3 M (1 S)	Growth only poor.
22	Beauty of Kent	S	S	G	S	M	G	M	G	S	G	S	G	M	15 G 3 M (5 S)	Average growth and pruning.
23	Lane's Prince Albert*	G	S	G	M	G	S	G	M	G	G	M	M	M	16 G 5 M (2 S)	"
24	Alfriston	S	M	G	G	S	M	S	G	S	G	S	G	G	16 G 2 M (5 S)	Strong growth.
25	Hambledon Deux Ans	S	S	M	M	S	M	M	G	M	G	S	M	M	12 G 7 M (4 S)	"
26	Peasgood's Nonesuch	S	S	S	S	G	G	G	S	M	S	G	M	M	14 G 3 M (6 S)	"
27	Queen Caroline	S	M	M	M	M	M	M	M	M	S	M	M	M	11 M 2 S	Average growth.
Totals for each year		7	3	11	8	12	10	8	12	8	10	6	7	8		
		5	8	2	7	3	5	8	4	4	5	4	9	7		
		5	6	1	2	2	2	1	1	5	2	7	1	2		

* See Note p. 396.

No doubt it may be objected that I attempted to grow too many varieties, but my answer is that my selection was made under advice, and my planting was purposely more or less in the nature of an experiment. Having grown so large a variety, and noted the results for over fifteen years, I feel I am in a position to give other amateurs the benefit of my experiences. Of course I do not profess to write for the enlightenment of the professional fruit-grower.

The following are my brief notes of the character of the seasons each year :—

1902.—Dry summer.

1903.—Wet summer.

1904.—Cold and dry summer.

1905.—Late spring frosts. Dry summer.

1906.—Cold spring. Very dry and hot July and August.

1907.—Cold spring. Wet and cold summer.

1908.—Late spring. Dry and wet periods alternating.

1909.—Cold, showery summer. Mild autumn.

1910.—Cold, showery summer. Mild autumn.

1911.—Cold spring. Hot, dry summer.

1912.—Early spring. Very wet summer.

1913.—Cold spring. Hot July; mild autumn.

1914.—Very early spring. Late frost (but did no damage). Fine, warm autumn.

SOME GOOD BOOKS FOR AN AMATEUR GARDENER'S LIBRARY.

By E. A. BOWLES, M.A., F.L.S.

[Read November 3, 1914. Dr. F. KEEBLE in the Chair.]

So runs the title chosen by your good Secretary when he invited me to give the lecture here to-day. Like all of his work, it shows width of scope combined with useful limitations. For there is scarcely any book on gardening that would not be of some value on an amateur's bookshelves, even though it were but to show from whence people derive their mistaken notions—as a tutor once said to me when at Cambridge, in warning me against the use of a certain commentary—"Oh yes, I have it on my bookshelf, but I only use it to find out where you all get your mistakes from."

But I am bound to put a check on the list by the first word "some," and to select with judgment that they may be good. Even then it would not be possible in the allotted time to do much more than mention the titles of books good for an amateur with a catholic taste in gardening, so I have thought it better to restrict this afternoon's lecture to passing in short review some of the most useful books on general gardening, endeavouring to point out the characteristics that seem to me to fit them for different requirements demanded by an amateur gardener, and to notice first Encyclopædias and then books by amateurs embodying their own experiences.

For one interested in the flower garden only, Robinson's "English Flower Garden" is absolutely indispensable. It was my first love among modern gardening books, and I have helped to turn many another beginner besides myself into a keen and thorough gardener by presenting him with a copy of this book.

I consider it contains more useful knowledge about the plants suitable for English gardens than any book of its size, which is saying a good deal when one realizes that it is an octavo volume of over 900 pages. Almost every page contains one or more charmingly artistic illustrations, mostly engraved from photographs.

The book itself has grown as a good garden does, by the addition from year to year of all that was suited to improve it, until now in its latest edition, the 12th, which appeared in 1913, nearly half the book deals with the artistic side of the work, and garden planning from every conceivable point of view, and the alphabetical list of plants completes the volume. To this portion the best experts of the day contributed articles on the families of plants they had specially studied, such contributions generally being marked by their initials.

It must surely be too well known and appreciated to need further praise and description. Its price is 15s.

Nicholson's "Dictionary of Gardening," in four volumes and a supplementary volume, is the next step and has not yet been superseded. If only the contents of the Supplement and the supplementary volume published in 1901 were incorporated with the whole work brought up to date, it would be as perfect as any work could be, in fact what its title-page claims for it, "a practical and scientific Encyclopædia of Horticulture." Its plan is excellent. Each generic name is followed by an explanation of its derivation where known; thus, "*Anomatheca*, from *anomos*, singular, and *theca*, a capsule or seedpod"; "*Apocynum*, from *apo*, away, and *kyon*, a dog—adopted by Dioscorides because the plant was supposed to be poisonous to dogs"; "*Bartonia*, in honour of Benjamin S. Barton, M.D., formerly Professor of Botany at Philadelphia." *Arum* is an instance of uncertain origin ("formerly *Aron*, probably of Egyptian extraction").

Next is given the natural order according to Bentham and Hooker's arrangement, followed by a description of the genus and general outlines for the cultivation of its species. Then a list of the introduced species, the Latin name of each being followed by an English translation, so that in this work we have an explanation of every Latin name. A clear and full botanical description of the plant comes next, and then mention of its native country, date of introduction, synonyms if any, any special cultural instructions should the species dealt with require different treatment from that advocated for the genus as a whole; and then, last of all, if it has been figured in any important work, a reference is given to the figure. Vegetables and fruits are dealt with very fully as well as flowers, garden insects, implements, and botanical terms, so that an ignorant amateur gardener should not exist providing he has money to buy and time to study Nicholson's "Dictionary of Gardening." The illustrations are plentiful and excellent, especially the smaller ones, which are most beautifully drawn and finely engraved on wood, and very superior to the larger ones.

There is a very good Pronouncing Dictionary in the supplement to Vol. IV., and also a wonderfully full list of herbaceous plants for special purposes, another of colours of flowers, and others for flowering periods, heights, bulbs, orchids, palms, bamboos, &c.; of trees and shrubs for special situations, of animals, beneficial or injurious, and of synonyms.

Unfortunately it is out of print, even the supplement, and the price of copies of the last and best edition is rising rapidly.

There is a French edition, translated and adapted for France by Monsieur S. Mottet. Canon ELLACOMBE uses this edition and declares it to be the best. I do not know whether it is still procurable.

A new edition of "Thompson's Gardeners' Assistant" by W. Watson, whose name alone insures the thoroughness of the work, was published in 1902.

It covers the whole ground of gardening, is simple and practical

in its statements, much fuller in the accounts of vegetables and fruits than Nicholson, while florists' flowers are treated more fully than the rarer plants. Its place on an amateur's bookshelf is due to its value in giving him information on matters that some would leave to their head gardener, and it is also very suitable as a present to a head gardener. A new edition, bringing all up to date, is in preparation.

It differs from the two foregoing books in being arranged under subjects, and not as a dictionary. The old editions are still worth consulting, and can be obtained secondhand for about 15s. The current edition, in six parts, costs £2 8s.

"The Standard Cyclopedia of Horticulture," by L. H. Bailey (6 vols., 25s. each vol., first two only issued in 1914). The American point of view predominates in this encyclopædia, but in this new edition the author has been careful to incorporate information from many European sources. Keys to the classification of important genera are given on Engler's plan where available. Each name is accented for pronunciation. Explanations of the most general specific names are given in a list in the first volume. The illustrations are poor, none too well drawn, and the blocks are worn out, but for those who cannot obtain a copy of Nicholson, and can afford to wait for and pay for this work, it may be classed as an indispensable.

"A Practical Guide to Garden Plants," by J. Weathers, brings together the commonest garden plants in one volume. It is arranged in families, not alphabetically, and may be described as a compressed Nicholson in selected form, suitable for the uninitiated amateur of smaller ambitions. It is both handy and inexpensive, costing a guinea, and deals with vegetables and fruit, but not the greenhouse.

Johnson's "Gardeners' Dictionary" is an old favourite, the first edition having appeared in 1846. It possesses no literary charm, but is very concise. There is a new edition, published in 1894, and edited by C. H. Wright and D. Dewar, that costs 9s.

Loudon's "Encyclopædia of Plants" claims to comprise "the specific character, description, culture, history, application in the arts, and every other desirable particular respecting all the plants indigenous to, cultivated in, or introduced into Britain."

This is no small boast, but one faithfully fulfilled in a very thick 8vo. volume of 1574 pages. The principal Cryptogams—that is to say, Mosses, Liverworts, Algæ, Lichens, and Fungi, as well as Ferns—are included, besides flowering plants; and in the edition of 1872, containing the second additional supplement, 21,289 species of plants are fully described.

To do this, even in so thick a volume, it was necessary to compress the information into the smallest possible compass, and the whole book is a model of careful arrangement. The left-hand pages throughout are divided into thirteen columns; by use of abbreviations and signs in many of them the reader can learn at a glance the principal

facts known about the plant. To take an example, under genus 1129, *Prunus*, the first column gives species 7056 *armeniaca* L. The second column the English name, *Common Apricot*. The third shows habit and gives a small symbol representing a leafless tree, signifying that it is deciduous. Column 4 shows duration and treatment in the garden generally by combining certain symbols. Here it is blank, which signifies it is hardy, and as the preceding column showed it to be a tree it is unnecessary to state it is perennial by a Δ . 5, popular character, fr.=fruit. 6, height, 15 feet. 7, time of flowering, f. mr.=February, March. 8, colour of flower; W.=white. 9, native country: Levant. 10, year of introduction of exotics, or localities of British species, 1548 in this case. 11, mode of propagation; L=layers. 12, soil; b. (should be h.=heavy rich clay). 13, reference to a figure; Lam. Ill. t. 431=Lamarck's "Illustrations de Genres." On the opposite page is a line of description sufficient for the recognition of the species, in this case "flowers sessile, leaves subcordate"; and below is a figure of two fruits and leaves engraved from drawings made for the work by Sowerby, assisted by Don and the Messrs. Loddiges. It seems needless to praise them for accuracy after mentioning such names, and though so small they are very useful. A note tells us

"*Prunus armeniaca*, Abricot Fr., Abricosenbaum Ger., Albicocco Ital., Albarcoque Portug., is a fruit tree next in esteem to the peach. From its trivial name it is generally supposed to have originated in Armenia, but Regnier and Sickler assign it a parallel between the Niger and the Atlas, and Dallas states it to be a native of the whole of the Caucasus, the mountains there, to the top, being covered with it Thunberg describes it as a very large, spreading, branchy tree in Japan. Grossier says that it covers the barren mountains to the west of Pekin, that the Chinese have a great many varieties of the tree double-blossomed, which they plant on little mounts for ornament, and dwarfs in pots for their apartments. It appears from Turner's 'Herbal' that the apricot was cultivated here in 1562, and in Hakluyt's 'Remembrancer,' 1582, it is affirmed that the apricot was procured out of Italy by Wolfe, a French priest, gardener to Henry VIII. The fruit seems to have been known in Italy in the time of Dioscorides under the name of *Praecocia*, probably, as Regnier supposes, from the Arabic Berkoch; whence the Tuscan Bacoche or Albicocco and the English Apricock; or, as Professor Martyn observes, a tree when first introduced might have been called a *praecox* or early fruit, and gardeners, taking the article *a* for the first syllable of the word, might easily have corrupted it to 'apricocks.' The orthography seems to have been finally changed to 'apricot' about the end of the last century.

"There are fifteen or twenty excellent varieties of apricot, besides the peach apricot, a large fruit supposed to be a hybrid between a peach and an apricot. The trees are generally budded on plum stocks, and always trained against walls. Apricots do not force freely."

This portion of the work is arranged on the Linnean System, in which artificial arrangement plants were arranged in groups according to the number of stamens and styles they possess. Although this has been long ago quite superseded by what is termed the Natural System, in which plants are grouped according to the sum of characters in their flowers and fruits, it is very useful when trying to identify a flower that is altogether strange to one. Loudon's "Encyclopædia of Plants," with its twenty-one thousand descriptions and numerous figures, has often helped me to name a flower when I was utterly puzzled as to its genus, and had but a very poor scrap of material to base my guesses upon; and for this use, and because it is not a costly work to buy, I consider it deserves a place on the bookshelf.

It has appeared in various editions from 1829-1880, and their prices vary from 5s. to £1 7s. 6d.

Loudon's "Encyclopædia of Gardening" is another marvel of research and careful arrangement.

Its title-page states that it comprises "the theory and practice of Horticulture, Floriculture, Arboriculture, and Landscape-Gardening, including all the latest improvements," and also that it is "a general history of gardening in all countries."

That strikes one as fairly comprehensive, but a glance at the table of contents causes one to marvel how any one man, even a Loudon, could have collected so much information on such a number of various subjects all connected with gardening. The general index alone amounts to 116 pages, and there are 1351 pages in the main body of the book, and this refers to the first edition of 1822, but there were many subsequent editions, and the last two were described as considerably improved and enlarged. I will select at random a few of the subjects dealt with to give an idea of its versatility. The first chapter deals with the Gardens of Antiquity, and even compares the traditions of the Garden of the Hesperides with the Biblical account of the Garden of Eden, pointing out the parallelism of the apples of Eve and Juno, and of the flaming sword, with the dragon which never slept, which guarded the entrance. In another chapter the gardens of the Romans are very fully described. Even Turkey in Europe, Poland, Portugal, and China are included in a survey of gardening in different countries. The section devoted to the Rise, Progress, and Present State of Gardening in Britain is a mine of information, tracing the succession of various schools of taste, with accounts of the men who created them. Also the progress in the cultivation of plants of ornament and flowers, as seen in books and accounts of old gardens. Norwich seems to have played a great part in fostering the love of flowers, and the Flemish emigrants who settled there in the middle of the sixteenth century cultivated Carnations and Tulips. A florists' feast was held there in 1637. Was this the first flower show in England? Sir William Temple, who flourished a little later, devoted himself to fruit-growing, leaving flowers to the care of the ladies, and only pleased himself with seeing and smelling them. All through the book pleasant

little sidelights on men and gardens are combined with sound instruction. The science of gardening includes the classification, structure and anatomy, nomenclature, functions, diseases, and geography of plants; soils and manures take us into the domain of chemistry and mineralogy.

Then there are chapters on implements, structures, and operations of all kinds, from sowing seeds to the superintendence and arrangement of every kind of garden imaginable.

Horticulture is dealt with in a large group of chapters on the kitchen garden and orchard, and is so marvellously arranged and divided into sections that we can find one devoted to plants used as preserves and pickles; another to edible wild plants neglected or not in cultivation, a very interesting one, in which we learn that "Shoots of Black Bryony and Burdock are good boiled as Asparagus." "Jack-by-the-Hedge, or Sauce-alone, *Sisymbrium Alliaria*, boiled separately and eaten to mutton, forms a desirable potherb." "Spotted Hawkweed, *Hypochaeris maculata*, is good as salad or boiled as greens." But as this plant is so rare and local in England few could find it and indulge in the luxury. Sowthistles' tender tops may also be boiled, and there would be no difficulty in finding this plant in most gardens, I fear.

A section headed "Substitutes for Chinese Teas from wild plants" is proof of the universal information packed away in this book. Edible Fungi and even Seaweeds are dealt with.

An especially interesting chapter contains Statistics of British Gardening—first, of the various conditions of *men* engaged in gardening; secondly, of the kinds of *gardens*, and ends with a list, arranged according to counties, of noteworthy gardens; and the last chapter I will mention is a useful list of authors on gardening, arranged by their native countries as well as chronologically. I bought my copy of the first edition of this book for 2s. 6d., and, though its binding is nothing to boast of, I am well pleased with my bargain and advise all of you to try if you cannot make as good a one. The later editions contain many improvements, notably the one by Mrs. Loudon in 1850, and its reprints up to 1871. These would cost about £1.

Miller's "Gardeners' Dictionary." Johnson, in "A History of English Gardening," wrote: "The publication of the seventh edition of that work in 1759 was of the greatest benefit to Horticulture. In it was adopted the classical system of Linnæus. It gave a final blow to the invidious line of distinction which had existed between the Gardener and the Botanist, and completed the erection of the art of the former into a science, which it had been long customary to esteem as little more than a superior pursuit for a rustic. From being merely practised by servants, it became more extensively the study and delight of many of the most scientific and noble individuals of this country."

I also quote from the preface to the eighth edition, the last published in Miller's lifetime, in 1768:—

"In the last edition of this work, the author adopted in a great measure the system of Linnaeus . . . , but as many of the plants which were treated of . . . were not to be found in any of Linnaeus's works then published, Tournefort's system was also applied to take in such as were not fully known to Dr. Linnaeus ; but since that time, the learned professor having made great additions to his works . . . the author has now applied Linnaeus's method entirely, except in such particulars where, the Doctor not having had an opportunity of seeing the plants growing, they are arranged by him in wrong classes ; as for instance the 'Ilex . . . and Laurus'"; and he goes on to show Linnaeus had not discovered that both of these bore the male and female flowers on separate plants.

Miller's work appeared first in an octavo edition in two volumes in 1724 and much enlarged in folio in 1731, an appendix being added in 1735. The book must have been in constant demand for the best part of a century, as edition after edition was published, the last (9th) newly arranged by Thomas Martyn (1797-1807). The "Figures of the most beautiful, useful, and uncommon plants described in the Gardeners' Dictionary" (1760) (300 coloured plates, price now £3 5s.), formed a most valuable addition ; they marked an epoch in botanical illustration, some of them being signed by unsurpassed masters like G. Elret. Nearly all the editions were pirated by Dublin printers ; and further, six abridged editions found a market. The work was also translated into German and French. It is a fine old book, but perhaps more of a luxury than a necessity for the ordinary amateur gardener.

So far I have named only large and important books, Encyclopædias, somewhat costly and useful to those with fairly large gardens, and a desire to be thorough in their work in them. So I will mention a small book, cheerily written, costing only half a crown, but very useful to a beginner with a small garden. It is "A Handy Book of Horticulture," by F. C. Hayes, Rector of Raheny, in the County Dublin, published in 1901. The author describes his aim in writing it thus : "There is a demand for a simple book on horticulture—a book, for instance, such as a country gentleman who is anxious to encourage his tenants, and to interest them in their cottage gardens, could put into their hands . . . to meet such requirements I have endeavoured to compile a Handy-book of Horticulture, which shall be at the same time simple and practical." I believe he has succeeded as thoroughly as anyone who has attempted the same sort of work, and the book should prove useful not only to those with small gardens and little knowledge, but also to teachers in horticultural classes in schools. There is a rich store of sound knowledge brightly and clearly set out in its pages ; for instance, "Under no circumstances should ground be trodden upon or worked when it is in a moist state. Garden plots, where this rule is broken, are generally more fitted for making bricks than for growing vegetables."

After describing the way to prune Red Currants by shortening

back the side shoots of the summer's growth to a couple of eyes, he passes on to Black Currants and tells us with these the old wood must be removed, as "Red and White Currants bear chiefly on the old wood, Black on the new." For Gooseberries "keep the centre open like a bowl; cut away the low branches which touch the ground when laden with berries. Cut away all cross stems, leave as much of the young white wood as possible, and avoid the mistake (into which so many gardeners fall) of treating their Gooseberry bushes as if they were Red Currants." And the treatment of lawns, florists' and border-flowers, potting, hotbeds, cold frames, vegetables, and in fact all branches of work necessary in a small garden are dealt with in an equally concise but sufficient manner.

There remains another class of books on "General Gardening," some of which are absolutely indispensable for an amateur who wishes to make and enjoy a beautiful garden as well as to understand how to cultivate and name his plants. These books have been written by owners of gardens and embody the experiences they have gained among their own plants. In them one looks for the secrets of success in the effective grouping of plants, hints for uses that the lesser known plants can be put to, and especially personal, historical, and literary associations concerning both plants and their introducers. The more the taste and individuality of the writers are interwoven with the information conveyed, the greater is the value of their books.

Of such books the first to appear was Alphonse Karr's "*Voyage autour de mon Jardin*," published in 1845. It is discursive, and as full of keen insight into human nature as of plant lore, and much is said of insects, birds, and books, but yet all has a bearing on the garden. The author settled at Nice in 1852, a period when so few flowers were cultivated in the Riviera that cut flowers for a local banquet had to be procured from Genoa. Alphonse Karr, gardener and poet, changed all that; his garden was the cradle of the great cut-flower trade of that region, and he lived long enough to say, "I am the last of the gardeners; they are all horticulturists now." It teems with pleasant "letters" which show his knowledge of the charms of a plant and of the weaknesses of gardeners. This delightful book is not well enough known. An English translation by the Rev. J. G. Wood can be found occasionally in second-hand book lists, priced about three or four shillings.

"My Garden," by Alfred Smee, was published in 1872. In a large quarto volume the author described the position, geology, contents, both vegetable and animal, of his garden at Beddington, in Surrey. For scientific accuracy at the date of writing, variety of subject, and wealth of illustrations the book is worth a place on a shelf large enough to make room for it without crowding out Miss Jekyll's books which I will mention presently. Compared with Karr's we feel it is rather didactic and too closely related to the text-book in style, although no doubt it would do us all good to read it thoroughly.

The same year saw the publication of Forbes Watson's "Flowers and Gardens," a small but epoch-making collection of short essays. The first twelve deal with the details of the beauty, and the meaning of that beauty, of such well-known flowers as Crocuses, Snowdrops, Primroses, Cowslips, and Daffodils, though occasionally his ideas appear rather fanciful and unconvincing, as in his explanation of the charm of Daffodil leaves consisting in its "suggestion of water, the source and type of coolness and freshness," and that the superficial appearance of the Cowslip is strongly suggestive of sheep. Yet there are so many sentences that show us in a flash beauties hitherto unnoticed that all should possess and read again and again this charming book. Thus, writing of the white, waxy, hardened tip of Snowdrop and Daffodil leaves, he points out first how it fits them for piercing the ground, and then writes: "And how wonderfully it adds to the beauty of these plants! Every artist knows what a striking effect can be given by a few well-placed dots to a broken line. And just so it is here. Their sparkling, dotty appearance makes the Snowdrop clusters look interesting and animated from the first moment that their tips pierce the ground, and in every later stage the leaves of both Snowdrop and Daffodil would seem tame and meaningless without it. . . . It emphasizes just that point which should catch the eye at once, guiding it straight to the outlines or leading lines, and rescuing the whole plant from what might otherwise appear but a confused patch of green."

Henry Bright has written of Dr. Watson: "No modern author, not even excepting Ruskin, has studied the form and the beauty of flowers so closely and lovingly."

As an instance of this I may quote the following:—

"One of the most beautiful points in the Primrose is the manner in which the paleness of the flowers is taken up by the herbage. Thus look at that down upon the flower-stalks, which clothes them like a soft thin halo, and seems, when you nearly examine it, to resemble the white silky fibres of that lovely mildew which so often forms on things decaying in close places, a something so delicate and half-transparent you think it might melt at a touch."

The second half of the book contains two chapters, one on Faults in Gardening, the other on Gardeners' Flowers, and Canon Ellacombe has declared in his preface to the second edition that this portion of the book "was the most powerful ally that natural gardening had at that time, and the one that gave the most important help in the destruction of the tyranny of bedding-out gardening. If it did not give the actual death-blow, it certainly gave the first of the death-blows and the one that had most effect."

This Dr. Watson did by showing how the beauty of individual flowers was lost by making it only part of a mass of colour. He wrote: "Our flower-beds are mere masses of colour instead of an assemblage of living beings: the plant is never old, never young; it degenerates from a plant into a coloured ornament."

He expresses his dislike for double flowers with great force, but quite justly to my thinking. Of the Hollyhock he writes: "Look, for instance, at the blossoming of a well-grown single Hollyhock with its central column of white mealy stamens, around which the bees are for ever digging and burrowing, and observe how beautifully this column completes the deep bowl-like corolla, and then stand apart and see how by these columns the whole spire is illuminated, every part of it brought out into clear relief as by a lamp placed in the centre of each flower. . . .

"Now would you think it possible that anyone would be willing to throw away these beautiful stamens and have the corolla choked up by a blind, unmeaning mass of spongy petal?"

And of the double Snowdrop:—

"All the characteristic beauty of the Snowdrop, the delicate curvatures of the petals, the contrast betwixt the light, thin, flexible outer petals and the inner, short, stout, unyielding cup, have disappeared, in order that that light graceful form may be stuffed out as you would stuff a pillow-case with a bunch of strips arranged like a pen-wiper."

Thus he fearlessly revealed his love for natural rather than artificial beauty, and greatly influenced those who read the book, and I cannot help thinking it would be well if the present generation of gardeners were more familiar with Forbes Watson's opinions.

"A Year in a Lancashire Garden," by Henry Bright, 1879, and "The English Flower Garden," 1881, by the same author, are two small books written in a fresh and chatty style, and full of useful hints and a true love of flowers. Both contain passages that carry on the war against the bedding-out system with much vigour. For example: "In the old walled garden, instead of the plants which so long had had their home there, each of which knew its season and claimed welcome as an old friend, there were bare beds till June, and then, when the summer was hottest, a glare of the hottest, brightest colours." Mrs. Earle has praised the earlier book so highly in her delightful "Pot-pourri from a Surrey Garden" that I feel I ought to like it better than I do, but must confess to preferring the second, though it is more general in scope.

"In a Gloucestershire Garden," by Canon Ellacombe, published in 1895, contains a series of papers on gardening, which he contributed to *The Guardian* during the years 1890 to 1893. I owe so much of my enjoyment of gardens and plants to alternating perusals of this book and visits to the author and the wonderful garden he has described in it, that I find it as hard to express my admiration of it as one would to describe the graces and virtues of one's nearest relations.

The author's wonderfully wide knowledge of men and books, his own and other countries, enabled him to take a many-sided view of the plants of which he writes, and I think the chief charm and value of the book arise from the fresh light such a knowledge throws on even

well-known plants. You are sure to find on every page some allusion that shows you the author has seen and read and remembered more than most men have, and the effect of this on the reader is to make him long to see for himself place and book and plant, that he too may experience the same delight in them as they have so evidently afforded to the author. For I know of no other gardening book that is so stimulating and so full of encouragement ; that points out so clearly that, to the patient planter and careful student, there will be interest and beauty in his garden from January 1 to December 31, if only he will look for it and work for it.

I will try to illustrate this with a quotation or two.

" It is very pleasant to be able to show growing together the Antarctic bramble,* with its curious skeleton leaves and white thorns, and the Iceland Poppy from the Arctic Circle, which is reported to be the most northern flowering plant known—so extremely northern that I was told by one of the officers in the North Pole Expedition that if there was land there he should expect to find the Iceland Poppy."

Do you not at once feel a new interest in these and wish to plant them side by side ?

Of the Hardy Palm, *Trachycarpus excelsus*, he writes : " The cultivation of the Hardy Palms is perfectly easy. The Arabs say that they require to have their feet in cold water and their head in a furnace. This combination we cannot give them, nor is it necessary ; they only require to be planted in good soil, to be protected from wind and not disturbed, and they will give a continual delight to the grower."

This I have proved, for, stirred up by this passage, and by admiration of the two very tall Palms at Bitton, I asked Canon Ellacombe, when he was staying with my parents, twenty years ago, to select a site in our garden for a Palm, and no plant gives me more continual pleasure than the fine fifteen-feet-high specimen that now stands there.

From this book I learnt to watch its leaves on snowy days, for he writes :—

" From the times of the Greeks and Romans, the Palm has been the accepted symbol of victory ; and the reason given was that however much the palm-leaves are laden with heavy weights they do not break, and are with difficulty bent, and if bent at all they soon rise up again. I have seen this prettily illustrated in severe winters, when the heavy snows have bent the tough leaves of the *Phormium tenax*, so that they could not rise again, . . . and Cedar branches were broken, the broad leaves of the Palm carried the heavy load of snow, and immediately the snow was removed the leaves sprang up and the plants were quite uninjured. The old emblem writers made good use of this character ; and Mary, Queen of Scots, took for her device a Palm bending under a heavy weight."

Do you know that " in a slight hoar-frost no hoar-frost is found on the plantains " ? Canon Ellacombe has noticed it on his lawn, and tells us it is because the broad leaves lying flat on the ground

* *Rubus cissoides* var. *fauperalus*.

keep in the earth's heat. Have you noticed that "Plants seem to know (if I may say so) when they are going to die, and then to be able to put forth more vigorous means for their reproduction?"

The Canon tells us: "For many years I have grown a pretty little Sea Lavender (*Statice cosyrensis*) from Cosyra, a small island between Italy and Africa, now called Pantellaria. Though a free bloomer, I never knew it to produce a seedling or to form seed. Last year it showed signs of decay from old age, and it entirely disappeared in the winter, but this spring I found a flourishing young seedling about a foot from the parent plant, and since that . . . two or three more."

The reviewer of the second edition in the *St. James's Gazette* described it as "a rare combination of erudition and observation," and concluded by saying, "The result of reading the book is to fill one with a longing to take Orders and study gardening if possible as Mr. Ellacombe's curate."

Besides this book, his "Plant Lore and Garden Craft of Shakespeare" and "In my Vicarage Garden and Elsewhere" have charmed many readers.

But Canon Ellacombe also carried with him an immense personal influence in instilling the love of the flower and the garden. Fond of books, he was one of the first to remind us what a treasury of gardening literature the seventeenth and eighteenth centuries had produced, and we feel, with him, that there is, on the close of the day, no more beautiful walk than that from the sunlit garden into the sombre shadows of the library.

But the books that make one determined to undertake garden alterations, to re-group one's plants, and attend more carefully to their good cultivation, are a certain three of the many delightful volumes written by Miss Jekyll. Her first book, "Wood and Garden," set many gardeners on a new road, teaching them what may be done in gardening for beautiful effect.

As with all books chronicling the work and results of one garden, readers must be careful to translate all statements into terms of their own soil and climate.

Few can make their garden in the clearings of such a beautiful Surrey woodland as Miss Jekyll found ready to hand at Munstead, or be able to have green paths of closely mown Ling, but the great value of this account of the growth and success of a very lovely garden lies in the fact that the great majority of plants used in its construction are perfectly hardy and easily obtained and grown.

The second book, "Colour in the Flower Garden," strikes me as the most valuable guide for making a beautiful garden an amateur can possess. It is the experience of years of successful work, reduced to masterly order—one might say a code of horticultural statutes, a working knowledge of which should be required of every undergardener as well as gardening amateur to bring about the ideal Utopian conditions of gardening.

If only the garden I tend possessed a soil of greater depth than two inches before it became coarse gravel, and a climate that was a less successful imitation of that of the Sahara in summer and the North Pole in early spring, I should long ago have been converted from my botanical ways, and the collecting and keeping alive of as many plants as possible, to follow Miss Jekyll's methods.

This paragraph on p. vi of the introduction makes my horticultural conscience quite uneasy every time I read it.

"I am strongly of opinion that the possession of a quantity of plants, however good the plants may be themselves and however ample their number, does not make a garden, it only makes a *collection*. Having got the plants, the great thing is to use them with careful selection and definite intention. Merely having them planted unassorted in garden spaces, is only like having a box of paints from the best colourman, or, to go one step further, it is like having portions of those paints set out upon a palette. This does not constitute a picture, and it seems to me that the duty we owe to our gardens, and to our own bettering in our gardens is to use the plants that they shall form beautiful pictures."

The photographic illustrations and the planting plans in this book are of the highest perfection and value.

"Gardens for Small Country Houses," by Gertrude Jekyll and Lawrence Weaver, is a wonderfully complete guide to the planning of most kinds of gardens. The illustrations and plans make one long to possess a small house in each of the southern counties of England, that one might own a garden planned on the lines of each style described in the book. Everything advised is so thoroughly good that I fear most of the plans would entail a good deal of expense to carry out. Let us hope a period of universal prosperity may soon follow this troublous one, and every small house may possess a garden as beautifully planned as those in this book.

A GUIDE TO THE LITERATURE OF POMOLOGY.

By E. A. BUNYARD, F.L.S., F.R.H.S.

A REVIEW of the literature of pomology within the scope of this paper necessitates certain limitations. Anything in the nature of a detailed survey will obviously be impossible, and the treatment of the subject must therefore be confined to a description of those books which stand out as landmarks in pomological history, either by reason of their originality or by their value as a focus of the knowledge of their time. It is also necessary to fix a starting-point for this survey, and the question, "At what time did pomological literature commence?" is difficult to answer.

The Greek and Roman agricultural writers, to go no further back, wrote much that is of great interest in the history of fruit culture, and indeed it is impossible to appreciate the works of later writers without some knowledge of this literature. Their influence continued for many hundreds of years, and it was long before experiment enabled men to question their magistral authority.

It was not until the Renaissance that a real literature of pomology arose, a literature which was critical and founded upon personal experience. I will therefore take this period, which has the advantage of being conveniently vague, as my starting-point.

The first writer who deserves mention is PIETRO DE CRESCENZI, or CRESCENTIUS, who, though not strictly a pomological author, had a remarkable influence upon the horticulture of his time. Born at Bologna in 1230, he spent much of his life in travel and at an advanced age returned to Italy, where he wrote his "*Opus Ruralium Commodorum*" at the invitation of CHARLES II., King of Sicily. This work was circulated in manuscript, and after the art of printing had become known in Europe it was printed at many different towns. It is said that a copy of this work was the first product of the presses of Louvain in 1474. Though written in the thirteenth century, it was not until the fifteenth century that its greatest influence was felt, and the numerous editions published all over Europe bear evidence of its great popularity. The chapters dealing with fruit cultivation are of much interest and show evidence of observation, only a few examples of which can be mentioned here. That strong-growing varieties of apples should be pruned in the summer is probably the first mention of summer pruning, and modern investigation is recalled by the advice to keep fresh-planted trees free from weeds until they are well rooted, after which it is not of such great importance. The storing of fruit in a dark place is recommended, and it is interesting to note the definite statement that no apples ripen in June or July.

After CRESCENTIIUS the next book of pomological interest is the very scarce work of ANTONINI VENUTI "De Notensis Agricultura Opusculorum," which was published at Naples in 1516. Nearly every kind of fruit has a chapter devoted to its cultivation and uses, very largely culled from PALLADIUS and other Roman authors. It is, however, of the greatest interest, as being probably the first book published which deals exclusively with fruits.

About this time France became the leading country in the production of garden literature.

The sixteenth century was a happy period for the industrious compiler, and such men as CHARLES ESTIENNE, brother of the famous printer, prepared many books based on the writings of the ancients, mingled occasionally with original observations. His "Praedium Rusticum" was such a work, and deserves notice as the foundation of the more famous "Maison Rustique." Nothing of first-rate importance, however, appeared until 1600, when OLIVIER DE SERRES published his remarkable "Le Théâtre d'Agriculture," a work which may truly be said to mark the departure from tradition and authority to the wider field of experiment and observation.

DE SERRES possessed in a large degree the "divine curiosity" which was so much a mark of the seventeenth century. At his home at Pradel, near Villeneuve, he founded what was probably the first experimental farm, and after a life spent in questioning Nature he employed his old age in setting down his experiences in garden and farm. His book is written in a charming style, and even nowadays is well worth reading, as its instructions in many garden operations can hardly be improved upon. The success of his book was instantaneous, and at the date of his death in 1619 it had already reached its eighth edition. His life has been written by HENRY VASCHALDE,* and his name is still honoured in France as the Father of French Agriculture. For pomologists his memory is kept alive by the late pear named after him by its raiser, M. BOISBUNEL, of Rouen. The value of the "Théâtre" is mainly cultural; some lists of fruits are given, but with few descriptions. We find, however, several fruits which are still grown, such as 'Bon Chrétien d'Hiver,' 'Caillot Rosat,' among pears, and 'Court Pendu,' 'Passe pomme,' 'Blanc doux,' 'Châtaignier,' among apples, all of which may be found in French gardens to-day.

To gain any real idea of the fruits cultivated at this time it is necessary to turn to the remarkable catalogue prepared by LE LECTIER. This industrious man was Procureur Royal at Orléans, and in his leisure moments a keen pomologist. In his garden he collected all the fruits of his time, and they numbered some 260 pears, 35 apples, and 27 peaches. By good fortune a unique copy of this catalogue has been preserved and is now at the Bibliothèque Nationale at Paris. This list of fruits has been reprinted by LEROY in his "Dictionnaire

* *Olivier de Serres*, by Henry Vachalde, Paris, 1886.

de Pomologie," and is most valuable as a witness of the great interest which must have been taken in fruit cultivation at this date.

The closing years of the sixteenth century mark the first appearance of a pomological literature in England. The earliest works were all translations or adaptations of French works. LEONARD MASCALL and BARNABE GOOGE were both translators, and it was not until WILLIAM LAWSON published his "A New Orchard and Garden" that we had a really English work. Authorities are not in agreement as to the date of the first edition, but the dates 1597 and 1615, given by JOHNSON in his "History of Gardening," are probably erroneous. The earliest edition I have seen is in the British Museum, dated 1617. Another edition is dated 1618, and is probably a reprint of the first edition, and the second and third editions are respectively 1623 and 1626. Many other editions followed, and it was reprinted with MARKHAM'S "Way to get Wealth" in 1648.

The book is quite original and contains very practical directions for laying down orchards, and it is of great historical importance as the first really English work upon fruit trees.

No work of outstanding merit, from the point of view of this paper, was published in England till the translation of QUINTINYE'S great work was undertaken by EVELYN. There are, however, two books which demand notice for the evidence they give of originality and research. The first of these is "The History of the Propagation and Improvement of Vegetables" by ROBERT SHARROCK. The author was born at Adstock, in Buckinghamshire, and took the degree of D.L. at Oxford and afterwards entered the Church. He was led to write his book by his distrust of the fantastic tales of graftings and buddings described in many books of the time, tales which he not unfairly considers worthy of the great Sir JOHN MANDEVILLE. Finding by experiment how impossible it was to graft an apple on a cabbage or an elm, he thought well to describe the methods and limits of this practice. The work is not wholly confined to the propagation of fruits, but it cannot be omitted in the consideration of pomological literature. The first edition is dated 1660 and has 150 pages. The second edition was enlarged to 255 pages and was published in 1672. The additions are general throughout, and do not consist of the adding of fresh chapters. The third edition (1694) was called "An Improvement to the Art of Gardening," but is identical with the second.

Somewhat similar in scope was the work of FRANCIS DROPE, entitled "A Short and Sure Guide in the Practice of Raising and Ordering Fruit Trees," published at Oxford in 1672. A fellow of Magdalen College and a divine by profession, he took "an inoffensive delight" in planting, and this delight is evident on every page of this little book. The fullest directions for raising stocks and grafting trees are given in a style which is full of charm and quaintness. The grafting and budding of trees entirely occupy the writer, and the instructions throughout are of a very sound and practical order.

The next book which had a real influence upon English fruit garden-

ing was EVELYN'S translation of DE LA QUINTINYE'S great classic, but before we consider this it will be well to return to French literature and its progress from the days of DE SERRES.

The seventeenth century marks the separation of horticultural from agricultural literature. With a few exceptions, such as the work of VENUTI above mentioned, nearly all the works published before 1600 were of the "Maison Rustique" type, dealing with all the occupations of the country. After OLIVIER DE SERRES a real gardening literature began to spring up and give ample evidence of the interest which was being felt in the art. It was the age of formalism, and in the "Théâtre des Plans et Jardinages" of CLAUDE MOLLET (1652) we see the beginning of the style which was developed by LE NÔTRE in later years, and which still remains the dominant influence in French gardens. The influence of such formalism was not without its effect in the fruit garden, and it was at this time that the espalier method of training came into great vogue. The author usually quoted as the first to deal with this form of training is JACQUES BOYCEAU, author of "Traité de Jardinage selon les raisons de la Nature et de l'Art." This is, however, a mistake, as OLIVIER DE SERRES devotes a whole chapter to this subject, and speaks of it as an ancient practice, and its existence in the fifteenth century can be proved. There is no doubt, however, that at this time fruit trees were subjected to the most severe pruning in the rage for formal shapes, and they were often trimmed into the devices now associated with the yew and box.

But it was not long before a voice was raised against this unnatural practice, and the importance of this movement in fruit culture makes it necessary to give some prominence to LE GENDRE, whose little work, "La Manière de Cultiver les Arbres Fruitiers," was published at Paris in 1652. Much has been written on the subject of the authorship of this work. Some authorities consider the name of LE GENDRE to be a pseudonym. Others allow LE GENDRE the credit of writing rough notes which were worked up by others. Against these suggestions there are certain facts. That such a person as LE GENDRE did exist is undoubted, and it is on record that he was born at Vaudreuil, in Evreux, in 1612. He occupied the joint post of almoner and superintendent of the Royal Gardens under LOUIS XIII. His cure was at Henonville, in Normandy, and there he gathered together a collection of rare fruits, flowers, and animals. That he was a man of education seems evident from his friendship with CORNEILLE, and this great poet has left verses commemorating the charm of the pastoral garden and its owner, one verse of which may be quoted here:—

" Des arbres si beaux, l'épaisse chevelure
 Conserve la fraîcheur d'une molle verdure,
 Où divers animaux que je ne connais pas
 Trouvent à se cacher et prendre leurs ébats "

CORNEILLE, however, discloses himself as no gardener, for the "épaisse chevelure" was the very thing that LE GENDRE set out to combat. It is his special merit that he realized that the pruning of

fruit trees must aim at a natural and not an artificial form. The "chevelure" system of pruning with shears receives his special condemnation, and he will have only the knife. Furthermore, he realized that different varieties, by their natural habit, demand different treatment in pruning.

This little book can hardly be valued too highly. Greatly superior to many works of numerous editions, it bears the imprint of the worker and observer, and conveys to the reader the real love of gardening more than any fruit book I can recall. His final counsels are admirable. "It would be useless to have examined with so much care the nature of fruit trees, to have given so many instructions for their right culture, if I did not finish by advice which I esteem the principal and most important of all: that one cannot have beautiful trees without loving them. Neither goodness of soil, nor rich manure, nor favourable situations will alone make them thrive, but it is the gardener's affection which makes them strong and vigorous."

A work which had a great popularity at this time was "*Le Jardinier François*" The author, NICHOLAS DE BONNEFONDS, was, it is said, *valet de chambre* to the French King, but little more is known of him. The first edition of his work was published in Paris in 1651, and contains some very interesting early copper plates. The work covers all the operations of the fruit garden, and includes some interesting lists of fruits. Several editions rapidly followed, and in 1658 it was translated into English as "*The French Gardener, Instructing how to Cultivate all sorts of Fruit Trees and Herbs for the Garden.*" The translation was stated in the first edition to be by "*Philokepos*," but EVELYN'S name appeared in the second. Bound with this is generally found "*Les Délices de la Campagne*," which follows the fruits into the kitchen and deals with their treatment there.

But the day for such homely works as these was passing, and the literature of fruit culture was coming to a stage when copious and magnificent volumes were published, works fully in keeping with the age whose King "had enough in him to make four kings and one honest man." Happily some part of this multiple personality was devoted to the development of the garden, and the final result, Versailles, has had a deep and lasting effect upon horticulture.

Almost equal in fame to the great LE NÔTRE in the formal garden was LA QUINTINYE in the "potager." Under his auspices this domestic quarter of the garden reached an importance hitherto unknown.

LA QUINTINYE was born in Angoumois in 1626, and died in 1688. He studied at first for a legal career, but a journey to Italy turned his thoughts to gardening, and he was called on his return by LOUIS XIV. to create the fruit and vegetable gardens at Chantilly, Rambouillet, and Versailles. For the royal table at Versailles every kind of fruit was wanted in perfection, and QUINTINYE supplied this both in and out of season, as forcing of fruits, vegetables, and flowers was largely carried on. His great work "*Instruction pour les Jardins potagers*

et fruitiers" was published in 1690, two years after his death, and was the most detailed work at that time upon fruit trees and their culture. Every aspect was treated with great minuteness, and in fact some five hundred pages are occupied with fruits. Cultural information occupies the greater part of the work, and there are a few points upon which he shows evidence of originality. His disregard of the influence of the moon, so long an important factor in all garden operations, was remarkable; but a zealous and conservative editor, fearing that this innovation might not be well received, added a chapter which reinstated the moon to its hegemonic position. In the pruning of the roots when transplanting, QUINTINYE anticipated the moderns by insisting that all fibres and roots smaller than a quill are valueless and should be entirely removed, as new fibres must be produced before the plant could absorb water from the soil.

The descriptions of fruits given are not very full, but more so than those given by his predecessors, and a new feature was added by the very full notes of the cultural needs and special preferences of the various fruits. Another useful item is a definition of various gardening terms. In pruning QUINTINYE was a firm believer in the maxim, "First make your tree, then fruit it"; and his counsel, "Retarder vos jouissances pour en jouir plus longtemps," was applied both to pruning and in his strong recommendation as to the need of thinning fruit. This latter point was probably somewhat new in his day.

The fame of QUINTINYE and his work at Versailles was soon spread far, and he visited England, where he met JOHN EVELYN, who later translated his book. It is not difficult to imagine the enthusiasm with which EVELYN would have welcomed the great French gardener, and the "Treatise on the Culture of Melons" which is added to the English translation was written at EVELYN's request. The success of the work was great; many French editions have been published, and it was also translated into Italian and Dutch.

EVELYN's translation was published in 1693 and entitled "The Compleat Gard'ner, or directions for cultivating and right ordering of Fruit Gardens and Kitchen Gardens, with divers Reflections on several parts of Husbandry" (folio, London, 1693). It is a complete and literal translation. The great length of the work and the tedious repetition of some parts made an abridgment obviously desirable. This was provided by the famous nurserymen LONDON and WISE, but was probably EVELYN's own work, and was entitled "The Complete Gardener, or Directions for Cultivating and right Ordering of Fruit Gardens and Kitchen Gardens. Now compendiously abridged and made of more use, with very considerable improvements, by George London and Henry Wise." (London, 1699.)

This work had an instant success and passed through many editions with great rapidity, the seventh being dated 1719. It was through this work that the precepts of QUINTINYE became generally known in this country, and their influence was very great for many years.

The opening years of the eighteenth century in England were

remarkable for an output of books on fruit trees, and there are many names from which it is difficult to select the most prominent. The dependence upon French authors had now ceased, a native literature was in full swing, and a certain revulsion from French influences may be noted.

The first author who claims notice is the Rev. JOHN LAURENCE, who was born at St. Martin's, Stamford Baron, Northamptonshire, where his father was incumbent. After taking his degree at Cambridge he was presented with the living of Yelvertoft, Northampton. Subsequently he was appointed vicar of Bishopwearmouth, Durham, and finally he was a prebendary of Salisbury. These changes gave him a wider experience of soils and climates than falls to the lot of many writers, and he made full use of this experience in his books. His first publication was "The Clergy-man's Recreation, Shewing the Pleasure and Profit of the Art of Gardening," an octavo published at London in 1714. This passed rapidly into many editions, and was followed by "The Gentleman's Recreation," London, 1716; "The Fruit Garden Kalendar," London, 1718; and "The Art of Gardening Improved," London, 1718; this last being a combination of previous works. A work called "A New System of Agriculture" (folio, London, 1727) contains some very useful chapters on fruit culture, and is of interest as presenting his matured opinions.

LAURENCE was no mere theorist, and many of his practices were decidedly original. He was a great advocate of the bush system of cultivation, and his recommendations on planting are interesting. In planting a young tree all the roots were to be cut back to 6 inches and all fibres removed. Three main roots were considered sufficient. In planting no hole was dug; the root was just pressed into the soil and then covered with a fine mould. This method was said to prevent the production of coarse roots and to be very successful. His remarks on diseases are very interesting, and he says: "Had I but elbow-room, I have a great inclination to turn Quack in Vegetables." His counsels to nurserymen of the day were very sound, and doubtless much needed if we may judge by a letter sent to a disappointed purchaser by a "merry fellow" whose trees had not turned out all that might have been expected. It is impossible to refrain from quoting this ingenious epistle:

"It is true you gentlemen charge us (and often very justly) with sending you down bad trees and wrong sorts; but though you may think us Knaves, you must not say we are Fools, for we have three *hits* for it. First, if the trees I send you down be a wrong sort or on a bad stock, the tree may die before it comes to bear, and then the fault is laid on the planter or other accidents and outward injuries, and so I hear no more of that, but another is sent for in its room, perhaps the same kind. Secondly, the Gentleman who sends for the tree may chance to die before it wins to bear, and then the next heir blames the choice and sends for another. Or, lastly, I die myself, and then the Proverb takes place, *De mortuis nil nisi bonum!*"

The works of LAURENCE had a great popularity, but they were overshadowed by the excellent book of STEPHEN SWITZER, whose "Practical Fruit Gardener" was published in 1724. In this the whole range of fruit culture is treated in a terse and clear style, and on every page it bears witness to a practical knowledge which was not too common in writers of those days. That SWITZER had no great opinion of QUINTINYE'S work is evident, and he speaks of his "round-about way" of conveying his opinions, but he is occasionally "oblidged" to admit that QUINTINYE was at times in the right.

SWITZER was a nurseryman; his advice on stocks was therefore from first-hand experience, and it is curious to note in this matter how little things have changed since his day. His book must be given a very important place in British fruit literature, and some writers have even gone so far as to consider it the first book on fruit culture of any value.

The next work of importance is the "Pomona" of BATTY LANGLEY. This is a folio volume; it was published in 1729, and is of interest as the first work in the English language which attempts to illustrate the different varieties of fruits. These illustrations are line drawings, but they certainly show a real appreciation of the characters of the fruits. The remarks on cultivation and descriptions of varieties do not present any special features, but the work was evidently popular, as it is frequently met with despite the adjective "rare," so often used in booksellers' catalogues. The author was born in 1696; he was an architect and garden designer, and published several books on this subject.

The remaining authors of the eighteenth century, such as HITT, the prolific ABERCROMBIE, and the voluble FORSYTH, need not for our present purpose detain us. The details of culture had been well thrashed out by previous authors, and little room for innovations was left. The development of pomology henceforward was mainly in the systematic description, and in the raising of new varieties.

There is, however, one author, L'ABBÉ SCHABOL, whose work is at first a seeming contradiction to this statement, though in fact it is not so. His contribution consists in placing on record the remarkable system of peach training which had for long been practised by the gardeners of Montreuil. In the "Journal Économique" of 1755 this method was explained to the great confusion of the scientific, who found untutored peasants training their trees on scientifically correct principles. It was SCHABOL'S good fortune to publish this method to the world, at first in the publication above-mentioned and afterwards in his "Dictionnaire des Jardiniers," 1767, and his "La Pratique du Jardinage," 1772. The latter work well repays study, as the instructions for pruning and the systems of training are described and figured with much detail, and several novel practices are there to be found.

It is necessary to return now to Continental writers to see the dawn of that greater exactitude in description which was to raise pomology to a branch of applied botany.

The introduction of a scientific method into pomological descriptions commences with DUHAMEL's famous "*Traité des Arbres Fruitiers*," which was published in 1768. This versatile writer, an analogue of our own JOHN EVELYN, published an enormous number of practical books on commercial processes, from clay pipes to Turkey carpets. He was, however, a trained botanist, and with the help of some keen fruit-growers, DENAINVILLIERS, LE BERRIAYS, and others, he produced a book which set a new standard of accuracy. The discussion in the preface of the characters which are sufficiently constant to be available as recognition marks is extremely good. He also realized that all the tree characters must be included in any accurate description. His illustrator was happily well supervised, and we therefore have fruits with their own leaves in true character, a feature rare in illustrations of fruits, where, for example, one leaf often serves for all the pears.

In the history of pomological literature, therefore, DUHAMEL stands prominent between the old and the new, and his influence may be traced in many of the books which followed. It will be convenient here to mention the many editions of his work, or rather of works to which his name was affixed. The first edition was the "*Traité des Arbres Fruitiers*," as mentioned above, 2 vols., Paris, 1768. A new edition in 3 vols. 8vo. was published in Paris in 1782, and a pirated edition at Brussels in the same year. A coloured edition, extracted from the great "*Traité des Arbres et Arbustes*," was then prepared by MIRBEL, POIRET, and other famous botanists. This also bears the old title, but is described as a "*nouvelle édition*" and is without date. It contains 150 plates from the designs of REDOUTÉ and BESSA. This may be called the first coloured edition. The second coloured edition was entitled "*Nouveau Traité des Arbres Fruitiers*"; it has 154 plates, and is edited by the same authors. As, however, neither of these editions is dated, it may be that their order should be reversed. The next edition (third coloured) was a sumptuous series of six volumes, containing 418 plates of great excellence. This was published by the house of Levrault, of Paris and Strasbourg, 1807-1835. It should be stated that the plates are numbered up to 329, but the total is made up by duplicated numbers. The last edition was practically a new work and is entitled "*Pomologie Française*," edited by A. POITEAU, 4 vols. in folio, Paris, 1838-1846, 433 coloured plates.

These various editions of DUHAMEL's work have been dealt with at some length, as they are somewhat confusing at first, and furthermore they represent in the later editions the finest and most complete works that can be found upon this subject.

Among the remarkable French works of the eighteenth century, it is impossible to overlook the "*Histoire Naturelle des Fraisières*" of ANTOINE DUCHESNE, which was published in 1766. As a monograph treating garden varieties of fruits with botanical exactitude, this little work stands alone for its period. On the historical and cultural

sides it is of no less interest, and in the history of strawberry literature it forms a starting-point of the utmost value.

In the nineteenth century the pomological literature of different countries entered upon more independent courses, and it will therefore be more convenient now to deal with each country separately, from 1800 to the present day.

LITERATURE OF THE NINETEENTH CENTURY.

GERMAN, AUSTRIAN, AND HUNGARIAN WORKS.

As the contributions of German authors have not yet been mentioned, it will be well to recall first the earlier works, *i.e.* those produced before 1800. In the Middle Ages, Germany was too much occupied in the rivalries of churches militant to give time for developing the peaceful arts. It is not surprising, therefore, that the pomological literature of those days is scanty, and it is not until the nineteenth century that such a literature really began. Rare books, of course, appeared from time to time, such as the "*Oenographia*" of FR. HELBACH, which was published in 1604, but the literature even of the eighteenth century was very largely based upon foreign authors. Such were, for instance, the "*Neue Gartenlust*" of HESSE, published in 1714, which was largely based on MERLET'S "*Abrégé des Bons Fruits*," and the "*Baumgärtnerei*" of 1763, adapted from LE GENDRE.

The first native work of real importance is the "*Pomona Franconica*" of J. MAYER, published in three quarto volumes at Nürnberg, 1776-1801. The 253 coloured illustrations, though rather crude, are nevertheless very useful, and a French translation of the text is given in parallel columns. This work was doubtless published in a limited edition only, and is now extremely scarce in a complete state.

The year 1780 saw the publication of the first serious attempt at a classification of fruits. The author was H. L. MANGER, Inspector of Buildings to the Queen of Prussia. The book, "*Vollständige Anleitung zu einer systematischen Pomologie*," is a folio of 192 pages, and contains two plates illustrating his classification by form. In the tabular arrangement, resembling that adopted later by THOMPSON in his R.H.S. Catalogue of Fruits, and in the historical notes, there is much of great interest. MANGER was the first of the great school of systematic pomologists which gave Germany so prominent a place in the early part of the nineteenth century.

An Austrian pomology of importance was the "*Pomona Austriaca*" of JOHANN KRAFT, published at Vienna in 1790-1796, 2 vols., with 200 fine coloured plates. This is a work of great value, especially for the South European varieties of fruits.

The opening years of the nineteenth century saw a remarkable expansion of a native literature, and the interest in fruit culture was greatly stimulated by the works of CHRIST, DIEL, and DITTRICH. The first named, CHRIST, was a country parson, and his works were mostly of a popular nature and did much to encourage the farmer and small

gardener to take up the cultivation of fruit. It may be said here that, though such works are not of importance in this survey of pomological literature, they are of the greatest value, and no reproach is intended in the use of the word popular in this connexion. It is the small books which have done most to create an interest in fruit culture, as they have reached the gardener directly. CHRIST's two works which bring him into the scope of this article are the "Pomologisch-praktisches Handwörterbuch" and the "Vollständige Pomologie." The first is a stout quarto of 431 pages and is arranged in dictionary form, giving descriptions of fruits and explanations of all the terms used in fruit culture. It was translated into Flemish by SERRURIER. The "Vollständige Pomologie" was published in two volumes at Frankfort in 1809-13, the first dealing with pomaceous fruits, the second with stone and bush fruits. This was a systematic work, giving full descriptions of varieties, and is still of great value.

FRIEDRICH A. A. DIEL was a fashionable physician at Ems, but his spare time and his years of retirement were devoted to pomology. His publications were almost entirely systematic, and they form a most valuable record of the varieties of the day. DIEL was fortunately also a grower of fruits on a large scale, and his nursery was of considerable extent. His most important book was entitled "Versuch einer systematischen Beschreibung in Deutschland vorhandener Kernobstsorten," 24 8vo. volumes, Frankfort, 1799-1825. It consists entirely of descriptions of fruits. Synonyms and references to literature are given, and tree characters are noted. This work is one of the classics of pomological literature, and occupies a place therein almost of equal importance to the "Species Plantarum" in botanical literature. A useful index was published by H. MEYER in 1834. The famous classification of fruits was published in the first volume, and it is upon this that LUCAS built the system used in Germany at the present time.

DIEL's work had only three coloured illustrations, and the need was felt for a book which should illustrate the varieties he had described. This was supplied by Baron VON AEHRENTHAL, who published about 1837 the first volume of "Deutschlands Kernobstsorten." (Three quarto volumes, Leitmeritz, 1833-1842?) This contains ninety-eight coloured plates, each illustrating four fruits. He describes the fruit and the tree in a concise manner. Publication was discontinued after the death of the editor. This is a scarce work, rarely found in libraries, but a copy exists in the British Museum.

The year 1819 was notable for the remarkable monograph on the cherry by TRUCHSESS, entitled "Systematische Classification und Beschreibung der Kirschensorten, von Christian Freiherr von Truchsess." This stout octavo volume of some 700 pages describes with great detail some hundreds of varieties.

The "Systematisches Handbuch der Obstkunde" of DITTRICH was published in 1837, and consists of three octavo volumes, each over 600 pages. This is a purely descriptive work and is of some importance, though not equal to that of

A finely illustrated work based on DITTRICH's book was published later, entitled "Deutsches Obstcabinet in naturgetreuen fein-colorirten Abbildungen . . . zu Dittrichs systematischem Handbuch. . ." (4to., Jena, 1855-6-7-8). This is a very valuable book. The plates are a little rough, but are all well drawn. Apples are shown in section as well as the whole fruit. The core is generally drawn separately, as are the seeds. In the section dealing with peaches, leaves and flowers are added. A notable feature is the excellent series of cherries and nuts, the latter having nowhere—as far as I have found—been so well illustrated in colour. The text is occupied only with references to the plates, and does not supplant DITTRICH's own descriptions.

There is some difficulty as to the different editions of this work. The first is probably dated 1853-60, but as I have never seen this I quote above from the edition in my possession, which is probably the second.

There are two other systematic pomologists whose works were published about this time who deserve mention. The first is F. W. HINKERT, Principal of the Pomological School of Weyhenstephan. His work consists of three octavo volumes and was entitled "Systematisch-geordnetes Handbuch der Pomologie" (Munich, 1836). It describes all hardy fruits in a clear manner, and is a work which, if not indispensable, is a desirable occupant of a pomologist's library.

DOCHNAHL's work, "Der sichere Fuhrer in der Obstkunde," was published in four small octavo volumes. The first (1855) describes 1263 apples; the second (1856) 1050 pears; the third (1858) is devoted to stone fruits, and the last (1860) to nuts and small fruits. By a careful system of abbreviation an enormous amount of information was compressed into these small volumes, each of which can be put into the pocket. A great feature is the careful synonymy, which forms a valuable guide to other literature. All fruits are classified, and in some cases the system is original. The descriptions are of necessity somewhat brief, but the work as a whole is invaluable for reference.

In 1859 the publication of the classical "Illustriertes Handbuch der Obstkunde" was begun under the joint editorship of JAHN, LUCAS, and OBERDIECK. This work contains without doubt more descriptions of fruits than can be found in any other publication. It consists of eight volumes. A general index was published with the eighth volume in 1875. The plan of the work is to give an outline drawing of each fruit with a full description; and while the earlier volumes deal with one kind of fruit only, *e.g.* vol. i., apples, vol. ii., pears, later issues take all fruits so as to bring it up to date. It would be difficult to overrate the importance of this work in the history of German fruit culture, both for its value as the standard work of reference for the old varieties and for the publication of accurate descriptions of the new ones. Three supplementary volumes must be added to the nine mentioned above: a list of additions and corrections, "Zusätze und Berichtigungen zu Bänden i. und iv.," by J. OBERDIECK, 1868, a supplementary volume on pears by LUCAS and OBERDIECK,

published in 1879, and one edited by LAUCHE, published in 1883 including the more modern varieties.

Of quite recent works there are a few well worthy of inclusion, and among the most important stands "Deutschlands Apfelsorten," by Dr. TH. ENGELBRECHT (Braunschweig, 1889, 8vo.). This work, as the title indicates, is entirely devoted to apples, and no fewer than 688 varieties are described, each being illustrated by an outline figure. The arrangement follows the DIEL-LUCAS system of classification. The fruit alone is described, but very fully, and certain details, such as the pistil characters, are not to be found in other works. References to literature are also given. The varieties described are naturally mostly of German origin, but a large number of the fruits are those of other countries.

A good work, with coloured plates, is the "Aepfel und Birnen" of GOETHE, DEGENKOLB, and MERTENS, an octavo volume published at Berlin in 1894. This describes briefly a selected list of 53 apples and 51 pears. A coloured plate of moderate merit is given of each sort. The work is useful for certain of the newer German varieties not figured elsewhere.

Of modern German works none better can be selected than "Deutsche Pomologie" by W. LAUCHE. This consists of six volumes, of which two are devoted to the apple, two to the pear, one to cherries and plums, and one to apricots, peaches, and grapes. The lithographed figures are very well produced, the colour being exact. A leaf and a flower are generally included. The whole plant is described, and references are given to history and literature.

MAURER'S "Stachelbeerbuch, über die besten und verbreitetsten Stachelbeersorten" (zusammengestellt von Louis Maurer, Stuttgart, 1913) is without doubt the finest monograph on the gooseberry that has yet appeared. One hundred and fifty-eight varieties are described and photographed, and fourteen coloured plates are added. The descriptions are the most detailed, and the name of MAURER is enough to ensure that they are the result of long and careful study. Very valuable are the preliminary notes on the constant characters used in description.

It will be noticed that all the works so far mentioned are systematic, and not cultural. Of the latter so many are produced that it is difficult to select any one as a typical example. In Germany, however, the works of GAUCHER have long been accorded a premier place for instructions on pruning, training, &c., and it will therefore be necessary only to refer to these.

The most elaborate is the "Handbuch der Obstkultur," by NICHOLAS GAUCHER, one portrait, 625 woodcuts, and 16 tables. This colossal work has already run into four editions, and for detailed instructions as to training trees it is probably unique.

A smaller work dealing with less detail on cultural matters is the "Obstbaukunde" by the same author, with 211 woodcuts (Berlin, 1912, 2nd edition). It provides ample information for the average gardener, and can be thoroughly recommended.

A recent work of CARL MATHIEU, entitled "Nomenclator Pomologicus, Verzeichnis der im Handel und in Kultur befindlichen Obst-arten, mit ihren Synonymen oder Doppelnamen" (Berlin, 1889), gives, as the title indicates, a list of names and synonyms with references to literature, and serves therefore as an index to pomological literature. It is of the greatest value in hunting up varieties, or as a record of names already applied, and is the most complete work of its sort yet attempted.

There are a few periodical publications which cannot be overlooked, and the most important of these are the "Pomologische Monatshefte." This valuable work was first published in 1855, under the editorship of OBERDIECK and EDUARD LUCAS, as the "Monatsschrift für Pomologie und praktischen Obstbau." It is continued at the present day as the "Deutsche Obstbauzeitung," and is the organ of the Deutsche Pomologen Verein at Eisenach. This is an extremely valuable publication, and represents a complete history of German pomology for 57 years. The coloured plates are of moderate excellence, and the articles are written by the best experts of the time. It is at present, as far as I know, the only real pomological journal published where new varieties are described and figured.

An older work of value is "Der Deutsche Obstgärtner" of J. V. SICKLER. This consists of 22 octavo volumes, and was first published in 1794. The illustrations are rather crude, but valuable for their date, and some interesting historical articles by SICKLER himself give the work a special value. The portraits of contemporary pomologists are another interesting feature.

Another publication worthy of mention is the "Zeitschrift für Obst- und Gartenbau," published by the Pomological Society of Saxony at Dresden, 1875-1908. This was called for the first three years the "Sächsische Obstbauzeitung."

The most important Pomology now being published is the "Deutschlands Obstsorten" edited by MÜLLER, GRAU, and BISSMANN. This was begun in 1905, and three fascicles are published each year (except in 1912 and 1913, when six parts were issued in each year). Each part describes four varieties of fruits, with a special full-sized coloured plate. A very important and new feature is a photograph of each variety in the winter state, showing very clearly the different types of growth. The fruit only is described in detail, but full particulars are given as to the habit and preferences of the tree, and a useful summary of bad characters. This work, when complete, will form a most valuable addition, and worthily ends this review of German literature.

FRENCH WORKS.

The nineteenth century in France was remarkable for an output of works on fruits of a variety and excellence which have never been surpassed. The works of DUHAMEL have been mentioned above and need not be referred to further. There were, however, many other

authors in the last half of the century producing works of great excellence, if not of so elaborate a character.

The first of them was "*Le Jardin Fruitier*" of NOISETTE (3 vols. 4to., Paris, 1821). NOISETTE was a well-known nurseryman, and his name is still commemorated by a class of rose named after him. The first volume deals with cultivation; the second describes the fruits; and the third is composed of coloured plates. These, though not of first-class merit, are nevertheless quite good and are evidently drawn by a pomologist. A second edition of this popular work was published in 1839, 2 vols. 8vo. The plates in this edition are by P. BESSA, artist at the Museum of Natural History at Paris, and are coloured lithographs of merit. The second edition is therefore preferable for the plates and figures of many additional varieties.

The lavish expenditure of the Second Empire was not without its benefits to fruit literature, as to Imperial generosity we owe the magnificent "*Jardin Fruitier du Muséum*." The author, JOSEPH DECAISNE, was Director of the Museum, now the Jardin des Plantes, and was a student under ADRIEN DE JUSSIEU. His training as a botanist was of great value, and his first works were all of descriptive and economic botany. The first volume of his work was published in 1858, and it was completed by the eighth volume, published in 1873. Of the colouring of the plates it is impossible to speak too highly; the lithographs are magnificent, and no pomological work has ever approached them for correctness of colouring. The drawing is of equal merit, and the wood and leaves of each fruit shown are indicated in outline with the greatest exactitude. The work deals mainly with pears, and vol. i. contains an elaborate monograph on the species from which the garden varieties have been derived. Peaches, a few plums and strawberries are figured, the last being described by Madame Vilmorin. It is a matter for regret that this splendid work had to be discontinued before the apples were undertaken, as, if complete, it would stand without a rival.

The next important work was the "*Pomologie Générale de la France*," published at Lyon by the Congrès Pomologique de France. This excellent work consists of 8 vols. large 8vo. (1863-1871), with coloured plates of each fruit. Only such fruits as were admitted by the Congress as of merit were included. The question of synonyms was fully dealt with, and the descriptions are most full and reliable. The fruits, leaves, shoots, and fruit buds are illustrated, and all kinds of fruits are included. The work as a whole forms a most valuable guide to French fruits, and is quite indispensable.

In 1865 a useful descriptive work was published by M. P. DE MORTILLET, a nurseryman of Grenoble, the first volume dealing with peaches. The second appeared in 1866 and describes cherries, and the third in 1868 is upon pears. The title is "*Les Meilleurs Fruits par Ordre de Maturité et par Série de Mérite*" (Grenoble, 1865-68). A curious feature is that much of the information is given in the question and answer form, a young man, "Léon," providing the questions

and the author the answers. This work is valuable, and the descriptions and outline drawings of fruits by the author alike give evidence of first-hand observation. Of special note is the treatment of the cherries, for which Grenoble has long been famous. The volume on pears is occupied largely with cultural matter, those described being a selected list.

Good as this work was, it was overshadowed by the masterly "Dictionnaire de Pomologie" of ANDRÉ LEROY, of which the publication was begun in 1867 and continued until 1879. Up to this time no such work had been published, and its treatment of certain points, such as, for example, historical references, make it even to-day a mine of information not to be found elsewhere. The descriptions of the fruits are not quite so full as those of the "Pomologie de la France" above referred to, but they are precise and generally sufficient. Outline drawings are given of each fruit, and often, where the variety is variable, two typical forms. Some idea of the extent of the work will be given by the following figures of fruits described: Pears, 915; apples, 525; peaches, 124; apricots, 43; cherries, 127. A volume on plums was in preparation, but the author's death prevented its publication. A very valuable feature is a reference under each variety to the authors who have previously described it. It is therefore possible to see at once the history of the fruit and to refer to the first record of the name. Another feature of great value is the addition of an historical sketch of each kind of fruit, showing in a most interesting manner the development, for instance, of the pear from Roman times to the present day. We may perhaps demur to a tendency to identify certain of our oldest fruits with those of Roman authors, as this, owing to the vague descriptions of those days, must be largely a matter of guesswork. These details and the elaborate and critical histories of each variety are the remarkable features of this invaluable work. A useful bibliography is to be found in the last volume.

The last of the great French systematic school was ALPHONSE MAS, who was born at Lyon in 1817. His life was entirely devoted to the study of fruit, and his garden at Bourg contained probably one of the finest collections of fruits ever gathered together in one place. His first book was "Le Verger, ou Histoire, Culture et Description des Variétés de Fruits le plus généralement connus" (8 vols. 8vo., Paris, Masson, no date, probably 1865-1874). It is entirely descriptive, and coloured plates are given of each fruit. These plates are of fair merit, the fruit alone being depicted. The great value of this work, however, lies in the remarkable descriptions. Wood, flowers, and leaves are all described with the greatest precision. MAS had a skill approaching genius for finding the happy word in this matter, and his remarks on the character of the tree as a whole are wonderfully suggestive. References are given to previous descriptions and to synonyms, but the historical notes are few and curt. A combination of this work and of the "Dictionnaire" of LEROY would make an ideal pomology. All hardy fruits are described except bush fruits,

raspberries, and strawberries. This work was, however, a selection of the best fruits, and the records of other fruits of less importance were published in his "*Pomologie Générale*" (1872-1883, 12 vols. 8vo.). In these volumes the fruits are discussed in the same detail as in "*Le Verger*," but the illustrations are outline drawings. As an indication of the extent of the work it may be stated that 581 pears, 253 apples, 147 plums, 71 cherries, and 22 peaches are all fully described. These two works of MAS are quite indispensable in any pomological library.

The last two descriptive works of importance which it is necessary to notice are published by the National Horticultural Society of France and by the Pomological Society, whose headquarters are at Lyon. The first-named published its work under the following title:— "*Les Meilleurs Fruits au Début du XX^{me} Siècle ; Histoire, Description, Origine et Synonymes de 250 Variétés Fruitières recommandées*" (Paris, large 8vo., no date—about 1907). Each fruit is shortly described and illustrated with line drawings of great excellence. All hardy fruits are described, and cultural notes are included for each kind. This work is especially useful as a selection of the most worthy fruits. It is not sold, but presented to members of the Society.

The work of the Lyon Society is on similar lines and is entitled "*Catalogue Descriptif des Fruits adoptés par le Congrès Pomologique*," Lyon, 8vo. 1887, Suppl. 1896. It is entirely descriptive, and each fruit is illustrated by an outline drawing. The descriptions are not very full, and tree characters are scantily described. This work is useful for its records of some of the newer fruits, but it is not so good as the production of the Paris Society.

A useful work was published in 1876 by the well-known nurserymen SIMON-LOUIS FRÈRES, of Metz, entitled "*Guide Pratique de l'Amateur de Fruits*." A very large number of fruits are briefly described, and while these descriptions consist only of a few lines, they are useful for the amateur. At the end of the work is an index, with an extensive list of synonyms, and this part is the most valuable feature of the work. A second and enlarged edition appeared in 1895.

It is necessary now to mention a few works on cultivation which have not been included in the above list. The French gardeners have always been famous for the refinements of training and grafting, and very many works have appeared on this subject. An author who had a great vogue in the middle of the last century was A. DU BREUIL. His best known works, "*Instruction élémentaire sur la Conduite des Arbres Fruitiers*" (1854) and "*Cours élémentaire Théorique et Pratique d'Arboriculture*" (5th edition, 1865), represent in an able manner the knowledge and opinions of his time upon all cultural matters.

A very interesting little work on grafting was published about 1868 by A. THOUIN, then Professor at the Muséum d'Histoire Naturelle at Paris. The title is "*Monographie des Greffes, ou Description technique des diverses sortes des Greffes employées pour la Multiplica-*

tion des Végétaux " (Paris, 8vo., 8 plates). There are a remarkable number of different methods here described and figured.

A very practical work, less detailed than that of DU BREUIL, was written by GRESSENT and entitled " L'Arboriculture Fruitière " (Paris, 1862). It is a very good general treatise, which does not enter too fully into the more elaborate details of training and grafting.

In more recent times CHARLES BALTET'S books have had a large circulation. His " L'Art de Greffer " still stands as the best exposition of grafting in all its branches ; an English translation was published in 1873, and other editions have since appeared. His other most successful work, " Traité de la Culture Fruitière commerciale et bourgeoise," indicates its scope sufficiently by its title, and has reached many editions.

Of quite modern works there is nothing, for clearness and brevity, to equal " L'Arboriculture Fruitière en Images " by J. VERCIER (Paris, 8vo., 101 plates). This work stands quite alone in giving a complete pictorial guide to the pruning and training of trees, an excellent feature being a drawing showing the pruning to be made and the result on the same page. This book can be highly recommended to all who wish to increase their knowledge of pruning and training fruit trees.

Periodical Literature.—There is not much to be recorded under this heading, though the proceedings of the many horticultural societies in France contain many interesting papers and first records of new varieties. The only important periodical entirely devoted to pomology is the Journal of the Société Pomologique de France, entitled " Pomologie Française." This was first published in 1872, and appears monthly. The " Revue Horticole," begun in 1829, still continues a flourishing course, and contains many excellent articles and coloured plates of fruits.

The Journal of the Société Nationale d'Horticulture de France contains some good articles in its earlier issues, but in recent years original contributions have become less frequent.

[NOTE.—No attempt has been made to refer in the above to the literature of the Vine, both on account of its extent and for its lack of interest to British gardeners.]

ENGLISH WORKS.

The opening years of the nineteenth century were the Golden Age of pomology in this country. The extraordinary expansion of commerce and the great prosperity it brought had an enormous influence upon horticulture and upon its literature. The remarkable output of books, many illustrated in an elaborate and costly manner, is evidence not only of a great gardening interest, but also of the means to encourage it. By a happy chance this period coincided with the appearance of several men whose names will always be prominent in pomological history. THOMAS ANDREW KNIGHT, THOMPSON, LINDLEY,

RONALDS, HOOKER, and BROOKSHAW, all produced their best work between 1800 and 1837, and during that period systematic pomology was established in this country.

The first of the group is THOMAS ANDREW KNIGHT. This gifted man, whose connexion with our Society is too well known to need repetition, was happy in possessing an enthusiasm for horticulture together with the leisure to indulge it. His work shows, unfortunately, the defects of his qualities. His descriptions of fruits are very slight, and some of his theories did not long survive him. Nevertheless, as a fruit breeder and fancier, his work was of the greatest importance. His principal book is the "*Pomona Herefordiensis*" (London, 4to., 1811). This was designed to depict the old cider and perry fruits of Herefordshire, and the plates are extremely good, being prepared by that great fruit-painter WILLIAM HOOKER. In the preface the author describes his method of cross-fertilizing, which seemed to be unknown in England at that time in so far as fruit-breeding was concerned. The work of MILLER had evidently been forgotten or overlooked. The remarks accompanying the plates have reference chiefly to the cider or perry qualities of the fruits. A smaller cultural work was published by KNIGHT in 1797, "*A Treatise on the Culture of the Apple and Pear*," a second edition in 1802, a third in 1808 and 1809, and the fourth in 1813. In this work the author states his famous theory of degeneration or "running out" of fruit, which is now disproved. A number of very valuable papers were contributed by him to the early volumes of the "*Transactions*" of this Society, and these are well worthy of study.

The next author who merits attention is GEORGE BROOKSHAW, who has the distinction of having published the largest work in size and the heaviest (on the scales) in English pomological literature. This is the "*Pomona Britannica*" (London, 1812), atlas folio, plates. It is an entirely descriptive work, and the text, though not giving the information needed by modern standards, is nevertheless good, and the plates are for the most part quite excellent. Especially may be noted the cherries and pine-apples. It is of great value as a record of the varieties of the day, many of which were grown at the Royal Palace of Kensington. BROOKSHAW's second work bore the same title, but was a quarto in two volumes, with ninety plates, and is a popular edition of the larger work. The plates are also very well prepared, and the date of publication is 1817. His last work was called "*The Horticultural Repository, containing the best Varieties of the different Species of English Fruits*." (London, 1823, 8vo.) The coloured plates in this work are extremely coarse, and the work is quite a worthless production. Copies were also issued with plain plates.

In the year 1818 was published the "*Pomona Londinensis*" of WILLIAM HOOKER. The title-page runs: "*Pomona Londinensis, containing the coloured Representations of the best Fruit cultivated in British Gardens. With Descriptions, in which the author is assisted*"

by the President and Members of the Horticultural Society " (London, 4to., 1 vol., 49 plates, 1818). This work contains some of the best coloured plates that have been published. The skill of HOOKER as a painter of fruits has never been equalled in this country, and here he is at his best. The descriptions of the fruits are good, and contain some interesting historical matter. It is to be regretted that this valuable publication was discontinued after seven parts only had been issued.

In 1826 the first edition of the " Catalogue of the Fruits cultivated in the Garden of the Horticultural Society of London " was issued. This was largely the work of ROBERT THOMPSON, fruit expert to the Society, and, I venture to think, the greatest English pomologist. The book was prepared to revise nomenclature and to settle the question of synonyms. That it was no mere desk work is evidenced by the volumes of notes and drawings in the Society's possession, in which the names and varieties are discussed by TURNER, LINDLEY, and above all THOMPSON, with the greatest detail. The arrangement of this catalogue is tabular, and the descriptions are of the vaguest, and in no way represent the enormous work which had been done before the true name of the variety had been settled. A second edition was published in 1831, and a third in 1842.

An important work with coloured plates was " The Pomological Magazine, or Figures and Descriptions of the most important Varieties of Fruits cultivated in Great Britain," by JOHN LINDLEY (3 vols. 8vo., 1827-30). This was afterwards reprinted as " Pomologia Britannica " in 3 vols. (1841). Though ostensibly by LINDLEY, the work was mainly due to ROBERT THOMPSON. The descriptions are not all of equal value, but most of them are very full, the wood and leaf being described as well as the fruit. The plates are good, and usually show a young shoot and leaf. The whole book gives evidence of careful observation and testing of varieties.

The year 1831 was notable for two works of importance in British pomological literature. The first of these is " A Guide to the Orchard and Kitchen Garden," by GEORGE LINDLEY, edited by JOHN LINDLEY, London, 1831, 8vo. The author was a nurseryman near Norwich, and the father of JOHN LINDLEY, Secretary to the Horticultural Society. He had been collecting material for this work for some forty years, and the result is a book of the greatest value. The descriptions of the fruit are fairly detailed, and the general notes upon each variety are most useful. A special feature is the record of many East Anglian varieties which are here described for the first time. The historical notes are a mine of information as to English varieties, and the dates of introduction of foreign sorts. LINDLEY's work has never been valued quite at its full worth, though it is without doubt one of the really important English books on pomology.

The next publication which rendered the year 1831 specially notable was the work of HUGH RONALDS entitled " *Pyrus Malus Brentfordiensis*, or a Concise Description of Selected Apples " (London,

1831, 1 vol., 90 pp., 42 coloured plates). The great importance of this work lies in its magnificent coloured plates of English apples. There is no work which has depicted so well and fully the native varieties of this country. The descriptions are short, and not very systematic, but too high praise cannot be given to the coloured drawings. These were done by Miss RONALDS under her father's direction, and I know of no work where the essential points of difference have so well been brought out, or the colours and textures better suggested. RONALDS was a nurseryman at Brentford; his knowledge of apples was gained from a lifelong experience, and his book is a worthy memorial to his labours.

After this book there was a long period in which no works of the first importance were issued, and it was not until the publication of the "Herefordshire Pomona" of HOGG and BULL that a really comprehensive work on fruits appeared.

There is one author whose work, though not of great importance, still merits mention, and this is JOHN ROGERS, the author of "The Fruit Cultivator," the first edition of which was published in 1834, and the second and third editions in 1835 and 1837. This little work bears all the marks of originality, and the author's racy personality is frequently in evidence. Both cultural and descriptive matter are included, and many interesting scraps of history are here to be found. It is an entirely human book, which even the most hardened systematist will benefit by including on his shelves. ROGERS was in his eighty-fourth year when he wrote this, and his opinions and counsels may therefore be considered mature.

In the year 1851 was published the first book by ROBERT HOGG, the pomologist, who for so many years stood high above his contemporaries in this country. This was entitled "The Apple and its Varieties, being a History and Description of the Varieties of Apples cultivated in the Gardens and Orchards of Great Britain" (London, 8vo., 1851; second edition, 1859). This was the first volume of a projected British pomology, a work which was not completed on the lines of this volume, but on the more restricted scale of the "Fruit Manual." This work is arranged alphabetically, describes all the more worthy varieties, and gives outline drawings of seventy fruits. A good feature is the reference to a first authority for the name of each fruit, and also to previous literature and coloured plates. A classification based on the season is introduced, but this was dropped by HOGG in later works for his later system of eye and core characters. This work is extremely useful, and one can only regret that it was not followed by further volumes dealing with other fruits in the same manner. In 1860 the first edition of the famous "Fruit Manual" appeared, a small 8vo. volume of very different appearance from the stout fifth edition. The descriptions are very short, but all hardy fruits are treated. Other editions rapidly followed, the second in 1862, the third in 1866, and the fourth in 1875, which was in size a near approach to the fifth and last edition of 1884. This work is so well

known that any detailed description is unnecessary. Judged by the highest standards, however, it cannot be considered a completely satisfactory production. Such descriptive works should belong to one of two categories: the popular work in simple language for the amateur or the detailed technical work for the expert. "The Fruit Manual" falls between these two. Too detailed and technical for the average amateur, it is not systematic enough to pass into the highest standard. HOGG was too much inclined to treat his fruits as museum specimens. His references to the tree are few indeed, and many things go to show that his study of the fruit commenced with its arrival in the fruit room rather than with its development on the tree. A small point in confirmation may be quoted. In describing the stems of apples he often refers to a "knobbed" stem or to an "extraordinarily thick and fleshy" one. This character is constant in certain apples, but by no means in all the varieties in which he describes it. A closer acquaintance with the tree itself would have shown that, when the central or "king" blossom of a truss is set, the stem is always much more stout and fleshy and the basin shallower than in those cases where a flower from the side of a truss is set, in which case the stem is always longer. Another fatal error was that HOGG sometimes made his descriptions from a single fruit sent him by a correspondent. This, it is hardly necessary to say, is against all the rules of accurate description, and the fact that he did not realize it throws a doubt on all his work. Another criticism must be passed on his lack of system in description. A character will be mentioned in one fruit and omitted in the next. It is evident also that some of the fruits he included had never been seen by him, as certain descriptions are borrowed without acknowledgment from other writers. Notwithstanding these faults, there is much to be thankful for in the "Fruit Manual," and an especially good feature is the careful historical notes after each variety. HOGG gathered together a huge amount of information, and stands out as the greatest pomologist of his time. One can only regret that a little more care and system were not applied, for they would have made the "Fruit Manual" worthy to stand by the best systematic works of any country.

The most recent pomological work of any extent is the "Herefordshire Pomona." This was edited by Dr. HOGG and Dr. HENRY GRAVES BULL, and published in 1876-1885 (3 vols. 4to.). The text is by Dr. HOGG, and is taken practically word for word from the "Fruit Manual." The introductory chapters upon the history and lore of the apple are by Dr. BULL and are of much interest, especially such parts as relate to the West Country. The coloured plates are very good. A considerable number of fruits is shown on each plate, generally without foliage. This book is valuable for its records of more modern fruits which are not elsewhere figured.

This list comprises all the most important descriptive works published in this country. Of cultural works there has never been so great an output as, for instance, in France. Of the older writers

no one put matters more clearly than ROBERT THOMPSON in his "Gardener's Assistant," and even to-day his directions in the first edition (1859) can hardly be improved. Modern cultural works will be found in the Appendix to this paper.

Periodical Literature.—The most important item in this division is the "Transactions of the Royal Horticultural Society," which were started in 1815. The fine quarto volumes have many articles of great value, and many excellent coloured plates of fruits. The earlier volumes were largely devoted to vegetables and fruits, and in these are many papers from T. A. KNIGHT.

Any detailed reference to important papers is, of course, not possible here, but the work of GEORGE LINDLEY on Peaches, vol. 5, and the valuable monographs by JAMES BARNET on the Strawberry, vol. 6, and of ROBERT THOMPSON upon Apricots, Cherries, and Gooseberries in vol. 1, second series, are well worthy of study.

There has been no strictly pomological publication in this country, and of the general gardening papers the best for illustrations and descriptions is the "Florist and Pomologist" (1862-1884), which contains valuable figures of fruits of fairly recent times not elsewhere to be found. It is not necessary to refer to the many excellent gardening papers which exist at the present day, as they are well known.

AMERICAN WORKS.

The history of American Pomology can be traced back to the early days after the arrival of the "Mayflower," and there is plenty of evidence that one of the first occupations of the settlers was the production of fruits. It was, however, many years before a native literature appeared, and the first work which comes within the scope of this paper was not published until the nineteenth century. This is the well-known work of WILLIAM COXE: "A View of the Cultivation of Fruit Trees and the Management of Orchards and Cider. . ." (Philadelphia, 8vo., 1817). This book is of great importance in many ways, but most of all for its early records of native varieties. The custom of raising fruits from seed, owing to the difficulties of distribution, has resulted in an enormous number of local varieties which, as communication improved, began to spread their fame. The uncertainties of nomenclature may be imagined, and it was COXE who first tackled this very difficult question. The work is largely descriptive, and many of the fruits are illustrated by coarse woodcuts. His descriptions are fairly complete, and the historical notes which are sometimes appended are most valuable. COXE was an observer, and his work gives evidence of original work in many directions and may be considered the foundation of American pomological literature.

The next published work was "The American Orchardist" of Dr. JAMES THACHER, Boston, 1822. It is mainly cultural and largely adopted from other authors, and need not therefore be described in detail.

From this date onwards many books were published, and some, such as "The New American Orchardist" of WILLIAM KENRICK, and the "Pomological Manual" of WILLIAM PRINCE, had much success.

In 1833 a reprint of LINDLEY'S "Guide to the Orchard" was edited by MICHAEL FLOY and adapted for American readers. In 1845 was published the famous work of A. J. DOWNING, which has taken from that time until the present day a most important position in America. The title will indicate its scope: "The Fruits and Fruit Trees of America, or the Culture, Propagation, and Management, in the Garden and Orchard, of Fruit Trees generally, with Descriptions of all the finest Varieties of Fruits, Native and Foreign, cultivated in this Country," roy. 8vo., 1 vol., New York, 1845). DOWNING was a nurseryman and was brought up among fruits, and while his book cannot compare with the systematic works which were being published at this time in Europe, he had an enormous influence in the encouragement of fruit-growing in America. A second edition, published in 1847, has several coloured plates, the first edition having only outline drawings. Space will not permit an enumeration of the many editions which have been issued of this work, the last being in 1886.

Another work of very similar character was "The American Fruit Culturalist" of J. J. THOMAS, first published in 1846. This is cultural and descriptive and of the popular handbook order, and had achieved twenty-one editions by 1905.

In 1852 the first American Pomology on an extensive scale, with coloured plates, was published. This was "The Fruits of America," by C. M. HOVEY. Fairly good descriptions are given, and the plates, lithographs of a rather crude order, show the young wood, spurs, and leaves. It is a useful work, but not comparable with more recent works published in the same country.

Useful as were such works, there was no originality of treatment nor any really scientific description of fruits in them. The first author who can claim to have made a real contribution to pomology is Dr. JOHN A. WARDER, who, in his "American Pomology," brought forward an original system of classification of apples. This work was published in 1867, and is occupied with the cultivation and description of apples only. This classification, like many others, was based first of all upon shape, and then subdivided into sections as to sweetness, colour, &c. He then proceeds to describe the fruits so classified, and these descriptions (of the fruit only) are a great advance on any previous work of the kind in his country. Very good outline drawings are given of many varieties.

The day of the nurseryman and amateur as pomological authors is now fast disappearing in America, and their place is filled by a benevolent Government which provides unlimited funds and expert specialists to write the books. The result of this combination is a happy one, and it is no exaggeration to say that never has pomology been so well supported as it is to-day in America. In no country are

so many really fine systematic books now being produced, and recent publications have set a standard of exactness which cannot but benefit the study of fruits all over the world.

The first of these works is "The Apples of New York," by S. A. BEACH (2 vols. 8vo., Albany, 1905). This is a purely descriptive work, with coloured plates or photographs of most of the varieties described. The descriptions are remarkably detailed, and deal with the tree as well as the fruit. References to literature are given very fully, and the commercial value and climatic preferences of the fruits are fully described. Of particular value is an introductory chapter dealing with characters which are of value in describing apples. This work is the best book on American apples, and is quite indispensable.

The next work of the same series is "The Grapes of New York," by U. P. HEDRICK (Albany, 1908). This is a large quarto volume, with full sized coloured plates. An extremely interesting chapter prefaces the descriptions dealing with the various attempts to acclimatize the European vine in America. The descriptions themselves are a model of what such things should be, and no feature is overlooked. A very valuable point in all these works is that the fruits are described on a regular and definite system.

The next volume of this series is "The Plums of New York," also by Professor HEDRICK, uniform with the last named and published in Albany in 1911. This is exactly on the same lines as that on the grapes, and the introductory chapters, one historical, and another discussing the species from which have been developed the plums of the present day, are most valuable. Though dealing primarily with American varieties, European sorts which do well in the State of New York are included. There is no finer work on plums at the present time, and it is good to hear that further volumes on peaches and cherries are in course of preparation.

Two works of reference which are quite indispensable are those compiled by W. H. RAGAN. The first is entitled "Nomenclature of the Apple, a Catalogue of the known Varieties referred to in American Publications from 1804 to 1904" (Washington, 1905). This is a useful work for establishing the priority of any name, and a short description of the fruit is given by a system of abbreviations which generally suffice to separate one fruit from another bearing the same name.

A similar work, entitled "Nomenclature of the Pear," was published by the same author in 1908, and is on the same lines as the above, with the addition of a reference to literature in many cases.

Several excellent monographs have been published under State auspices in recent years, such as that on "The Fig," by GUSTAV EISEN (Washington, 1901), and other works which are referred to under their separate headings in the Appendix.

Of the many excellent cultural works there is not space to treat here. A special feature of recent years is the large number of very practical works on commercial fruit-growing, some of which will be found under the heading "Fruit Farming" in the Appendix.

Periodical Literature.—Of the first importance under this heading is the valuable "Report of the American Pomological Society," issued biennially from 1852 to the present time. Many very interesting papers and reports will be found in it.

The only periodical works, I believe, devoted entirely to pomology are the "North American Pomologist" of HOFFEY (only vol. 1, 1860, published), and "The Orchardist's Companion," by the same author (Philadelphia, 1841-3). This is a quarto, with full-sized coloured lithographs by the author, and is an interesting work historically, being the first American work with coloured plates of fruits. Unfortunately, public support did not suffice to permit its continued publication.

The reports of the U.S.A. Department of Agriculture (1862-1894), and the "Year-Book" published annually since that date, contain many good plates and descriptions of new and interesting fruits.

DUTCH WORKS.

A comparison of the literature of Holland with the interest and excellence in gardening of the Dutch is somewhat surprising. The Dutch evidently did not suffer from the *Cacoethes scribendi*, and it is not until the middle of the eighteenth century that we find any really important work. The culture of oranges and other citrous fruits was in great favour in the seventeenth century, and a few works were published upon their treatment, such as the "Citricultura" of FR. VAN STERBEECK, 1682, and the "Nederlantze Hesperides" of COMMELYN in 1676. Other gardening books, such as the "Nederlandsen Hof" of VAN OOSTEN and the "Pomona" of J. C. DOOR (1663), touch briefly upon fruits, but these need not be considered here.

The first great work of real importance was the "Pomologia" of J. H. KNOOP, which was published at Leeuwarden in 1758. It is of special interest as the first pomological work which was fully illustrated with coloured plates. As may be expected, the colouring is somewhat crude, but nevertheless a very good idea of the various fruits is given. This work had great popularity and many editions were published, also a translation into French. A German translation, published at Nürnberg in 1760, should be noted, as the second volume is an entirely new production, the author being, on the authority of MAYER, Pastor ZINK, of Meiningen. KNOOP's work is wholly descriptive, as he had treated cultural matters in an earlier volume, namely, "Beschouwende en Werkdagige Hoveniers-Konst" (Leeuwarden, 1753).

From this date until recent times there is a remarkable gap in Dutch pomological literature, and I can find no work of real importance until the work of VAN NOORT, "Pomologia Batava, of Avbeelding en Beschryving van onderscheidene soorten van Appelen en Peeren" (Leiden, 1830-1840; 20 apples and 20 pears illustrated), which I have not yet seen.

A modern work of great value on account of its record of Dutch varieties not figured elsewhere is the "*Nederlandsche Boomgard*," which was published at Boskoop in 1868. The editors were OTTOLANDER-KOSTER, HOOFTMAN, and OVEREIJNDER, and the coloured plates were by BERGHUIS. These plates are excellent, and the descriptions given full and exact.

PORTUGUESE WORKS.

I have been able to find only one book of strictly pomological interest in Portuguese—the "*Diccionario das Peras Portuguezas*" by OLIVIERIA (Oporto, 1879, large 8vo.). There is doubtless much to be added to this list.

SPANISH WORKS.

The pomological literature of Spain seems to be very scanty. In the elaborate "*Diccionario de Bibliografia Agronomica*" by ANTON RAMIREZ, no work of importance is recorded. The only books I have seen are those of D. F. SALA Y ARNELLA, entitled "*Frutales*" (Barcelona, 1860, 8vo.), a small cultural work upon the origin and cultivation of fruit trees, dealing with them from the nursery stage upwards, and the "*Pomona de la Provincia de Murcia*" of DON JOSÉ Y PEREZ (Madrid, 1884, 4to.), with short cultural notes and fairly full descriptions of various fruits.

A few interesting papers may be found in certain journals, such as the "*Agricultura Española*" (1858-61) (vol. I contains a list of Pears and Almonds), and in the "*Boletin d'Agricultura*" (Madrid, 1857).

RUSSIAN WORKS.

Russian works on pomology are not many, and I believe the following names include the most important:—"Kratkaya Pomologia," by USSIKOV (Petrograd, 1900), an octavo volume with plain lithographs of apples and pears. Plums and peaches, &c., are described, but not figured. "*Pomologie*," by LEON SIMIRENKO (8vo., 1901), contains photographs of nearly all fruits, with special reference to Crimean varieties. A new and enlarged edition appeared later.

The finest work is probably the "*Atlas Plodov*" (Petrograd, 1903-7, 4 vols. large 8vo.), with 100 coloured plates. This is a magnificent work which equals the best done in France or England. The plates for the most part are original and of great merit, both pomological and artistic. Some few of the illustrations, however, are borrowed, from the "*Aepfel und Birnen*" of GOETHE and others, and these are markedly inferior. So far as I can ascertain, this book is the best and most complete Russian work yet published.

An index of names in roman type renders it useful to those who do not read Russian.

BELGIAN WORKS.

The pomological literature of Belgium will naturally only date from the early nineteenth century, though certain small works, such as "*Essai sur la Greffe*," by CABANIS (Liège, 1784), antedate that period. The independent and important horticultural history of Belgium, however, reached its highest point in the middle of the last century, and its literature naturally reflects this period.

The first work which claimed readers beyond the national boundaries was the work of VAN MONS, "*Arbres Fruitières. Leur Culture en Belgique et leur Propagation par Graine*" (Louvain, 1835). This work contains the fullest statement of the famous theory of VAN MONS on raising seedling fruits. It must be confessed that the student will have to search carefully therein to find this theory, so overlaid is it with repetition and contradictions. The work, however, provided material for many lengthy disputations, and so served a useful purpose as a stimulant if not as an exposition.

Of greater interest for our present purpose is the catalogue of his nursery, "*Catalogue Descriptif Abrégé, contenant une Partie des Arbres Fruitières qui depuis 1798 jusqu'en 1823 ont formé la Collection de J. B. Van Mons . . .*" (Louvain, 1823, 8vo.). The historical value of this little work is very great, and it is now exceedingly scarce.

The successor to VAN MONS was ALEXANDRE BIVORT, and in 1847-51 he published his "*Album de Pomologie*," an oblong folio in four volumes. This book is of great value as it contains coloured plates and accurate descriptions of many of Van Mons' seedlings, and forms a wonderful record of the great number of new fruits which were at this time being raised in Belgium. The coloured plates are fairly good, better in the later volumes, and the descriptions are excellent.

The next important work was the result of royal munificence, and was entitled "*Annales de Pomologie Belge et Étrangère*." This was edited by L. DE BAVAY, AUGUSTE ROYER, AUGUSTE HENNAU, and BIVORT. Eight large folio volumes were published, the first in 1853 and the last in 1860. The descriptions of many fruits are taken from BIVORT's "*Album*," but the greater number are original. The plates are well produced, but are not quite of the highest excellence. This work had a great success and remains the classical work of reference, with BIVORT's "*Album*," for varieties of Belgian origin. Since 1860 no important pomology has been published in Belgium, but there are two works of historical interest which may be mentioned here. The first is the "*Pomone Tournaisienne*" of J. B. C. DU MORTIER, Tournay, 1869. It is an attempt to record the gains of the Belgian pear-raisers; the author's historical remarks are interesting, and are followed by a list of fruits under their raisers' names; and finally outline drawings and short descriptions are given of ninety-one selected pears.

It must be said, however, that the lists are in several cases incomplete, and the book cannot therefore be entirely relied upon.

A better and more accurate attempt at the same object is the paper on Belgian fruits by CHARLES GILBERT, published in the "Journal of the Royal Linnean Society of Belgium" in 1874. This gives the names of all Belgian raisers and their gains, and includes some very excellent critical notes upon the re-namings that so many of these fruits have undergone.

The cultural works published towards the end of the nineteenth century are very numerous, but they need not be detailed here. Reference cannot, however, be omitted to the excellent work of PIJNAERT, "*Les Serres Vergers*," which was published about 1880 and contains the fullest directions for the forcing of all fruits under glass with a wealth of detail not met with in any other work I am aware of.

Periodical Literature.—Belgium has been fortunate in her periodical literature, and the skill of her native gardeners and lithographers has made much of it of permanent value. Especially useful is the "*Bulletin d'Arboriculture*," which was started in 1865. The articles and coloured plates of fruits are numerous and good, and an excellent index added in 1883 renders these readily available.

Another valuable publication is the "*Belgique Horticole*." This is especially good in historical information, and the complete series runs from 1850 to 1885.

The "*Flore des Serres*," though generally devoted to flowering plants, has some good plates of fruits, especially in volume 19 (1871-3).

ITALIAN WORKS.

In the earlier part of this paper mention was made of the interesting volume of VENUTI as probably the first book dealing exclusively with fruit. There are also a few other Italian authors who merit attention before the more modern works are considered.

It is natural that early Italian literature should deal very largely with the Vine, but this is rather outside our scope. The authors of the sixteenth and seventeenth centuries were mostly adapters or compilers from the ancients, and such books as that of GIOVANNI TATTI, "*Della Agricoltura*" (Venice, 1560), with its short notices of fruits, are of interest only historically. A more useful book was that of G. SODERINI, "*Trattato della Coltivazione delle Vite e del frutto che se ne può cavare. . .*" (Firenze, 1600). The well-known "*Vinti giornate d'Agricoltura*" of AGOSTINO GALLO (Torino, 1519) is a type of country book which was fairly common at this time.

No really important work, however, was published until 1633, when GIOVANNI BATTISTA FERRARI, a Jesuit monk of Siena, published his "*Hesperides, sive de Malorum aureorum cultura et usu*." This is a folio, with elaborate plates of oranges and lemons, and of gardens and garden tools. The fruits are very fully described and some

unusual types depicted, which may also be seen in the Dutch works on oranges which followed in the later years of the seventeenth century. It is entirely in Latin, and is a remarkable example of an early treatise upon citrous fruits.

In the eighteenth century I have found little of note ; a translation of " *Le Jardinier François* " was published in 1723, and an interesting book upon the peach, entitled " *Trattato di Coltura di Persici e di Alberi di frutto* " (Venice, 1792). This is an elaborate cultural work of some 240 pages.

The finest Italian pomology was, without doubt, the work of GALLESIO entitled " *Pomona Italiana ossia Trattato degli Alberi Fruttiferi* " (3 vols., 172 coloured plates, Pisa, 1817-39, folio). The plates are of varying merit, some being of great excellence and others very poor. A very special feature is the large number of figs which are illustrated and described. This work is now extremely scarce, but a copy is in the Lindley Library.

A few years later a useful work was prepared by A. PICCILOLO, entitled " *Pomona Toscana, che contiene una breve descrizione di tutti i frutti che si coltivano nel suolo Toscano per servire alla collezione in gesso medesimi* " (Firenze, 1820).

The only recent pomology which has come to my notice is the recent work entitled " *Pomologia: descrizioni delle migliori varietà di Albicocchi, Ciliegi, Meli, Peri, Peschi,* " by GIROLAMO MOLON (Milan, 1901). This is a small octavo of some 700 pages, entirely descriptive, and with a few coloured plates and some photographic illustrations. A useful feature is the very full reference to literature given for each variety, and the discussions on the species should also be mentioned.

SCANDINAVIAN WORKS.

The pomological literature of Scandinavian countries is rarely met with in the libraries of Central Europe, and this list cannot be put forward as including all important works, but is as complete as my present opportunities can make it.

The earlier works were mainly of the cultural order, and the first I have found dealing with fruit trees alone is the " *Konsten at Skära Frukt Träd* " (The Art of Nursing Fruit Trees), by J. J. FRAGROEUS.

The great botanist PETER KALM did not disdain to write of the fruit and kitchen garden, and several pamphlets were published by him on fruit trees about the year 1757.

Of the works of the nineteenth century the following are probably the most important :—" *Svensk Pomona,* " by OLAF ENEROTH (1864-1866), descriptions and plates of fruits, but the drawing and colouring are coarse ; " *Den Danske Frugthave. Et Billedvaerk for Udbredelse af Kjendskab til Landets Frugter udgivet af et Selskab* " (Svendsborg, 1869-70-71), 120 plates ; " *Svenska Trädgårdsföreningens Tidskrift,*

redigerad af AXEL PIHL och JAKOB ERIKSSON" (1878 and foll.), contains many coloured plates of fruits; "Svenska Fruktsorter i färglagda Afbildningar utgifna af Svenska Trädgårdsföreningen, under redaktion af AXEL PIHL och JAKOB ERIKSSON," Stockholm (1899 and foll.); and "Haandbog i dansk Pomologi, af H. C. BREDSTED," 3 vols., Odense (1890-1896), with descriptions and outline drawings.

APPENDIX.

A SELECTION OF IMPORTANT POMOLOGICAL WORKS.

I. GENERAL POMOLOGIES.

This section includes the more important descriptive works.

1. ENGLISH.

KNIGHT, T. A. "Pomona Herefordiensis." (Cider Fruits.) 1 vol. 4to. col. pls. London, 1811.

BROOKSHAW, G. "Pomona Britannica." 1 vol. atlas folio, 1812.

— "Pomona Britannica." 2 vols. 4to. col. pls. London, 1817.

HOOKE, W. "Pomona Londinensis." vol. 1 (all pub.) fol. col. pl. London, 1818.

LINDLEY, JOHN. "Pomological Magazine, or Pomologia Britannica." 3 vols. roy. 8vo. col. pls. 1828-30.

— GEORGE. "A Guide to the Orchard and Kitchen Garden." 1 vol. large 8vo. London, 1831.

RONALDS, HUGH. "Pyrus Malus Brentfordiensis; or a Concise Description of selected Apples." 1 vol. 4to. pls. London, 1831.

HOGG and BULL. "The Herefordshire Pomona." 2 vols. fol. col. pls. London and Hereford, 1876-1885.

HOGG, ROBERT. "The Apple and its Varieties." 1 vol. 8vo. Illus. London, 1851.

— "The Fruit Manual: A Guide to the Fruits and Fruit Trees of Great Britain." 1 vol. 8vo. 1st ed., London, 1860; 2nd ed. 1862; 3rd ed. 1866; 4th ed. 1875; 5th ed. 1884.

SCOTT, JOHN. "The Orchardist, or Catalogue of Fruits Cultivated at Merriott, Somerset." 1 vol. 8vo. 1st ed. 1868, 2nd ed. 1873.

2. AMERICAN.

COXE, WM. "A View of the Cultivation of Fruit Trees and the Management of Orchards and Cider." 1 vol. 8vo. Illus. Philadelphia, 1817.

EMMONS, EBENEZER. "The Natural History of New York." Vol. iii. "Fruits." 2 parts, col. pls. Albany, 1851.

DOWNING, A. J. "The Fruits and Fruit Trees of America." 1 vol. roy. 8vo. col. pls. New York, 1845. Revised 1857, 1869. Appendices, 1872-76-81.

THOMAS, JOHN J. "The American Fruit Culturalist." 1 vol. roy. 8vo. Illus. New York, 1st ed. 1846, to 21st ed. 1903.

HOVEY, C. M. "The Fruits of America." 2 vols. 8vo. col. pl. Boston, 1852-56.

WARDER, JOHN A. "American Pomology: Apples." 1 vol. cr. 8vo. Illus. New York, 1867.

3. FRENCH.

DUHAMEL DU MONCEAU. "Traité des Arbres Fruitières, contenant leur figure, leur description, leur culture, etc." Paris, 2 vols. 4to., 1768.

MIRBEL, POIRET, ET LOISELEUR DES LONGCHAMPS. "Traité des Arbres Fruitières." Nouvelle édition. 150 col. pls. by Redouté and Bessa. 2 vols. folio. Paris (1820?).

J. ST. HILAIRE, MIRBEL, POIRET, ET LOISELEUR DES LONGCHAMPS. "Nouveau Traité des Arbres Fruitières . . ." 2 vols. folio. Paris (1850?).

POITEAU ET TURPIN. "Traité des Arbres Fruitières . . ." 418 col. and 2 plain pls. Paris and Strasbourg, 1807-35. 6 vols. folio.

POITEAU, A. "Pomologie Française. . . ." 4 vols. folio. 433 col. pls. Paris and Strasbourg, 1846.

NOISETTE, LOUIS. "Le Jardin Fruitier: histoire et culture des arbres fruitiers. . . ." 3 vols. 4to. Paris, 1821. 2nd ed 2 vols. 8vo. 1839.

DECAISNE, JOSEPH. "Le Jardin Fruitier du Muséum . . ." 9 vols. 4to. Paris, 1858-75.

— "Pomologie Générale de la France." 8 vols. 8vo. Lyon, 1863-1871.

DE MORTILLET, P. "Les Meilleurs Fruits par ordre de Maturité et par Série de Mérite." 3 vols. 8vo. Grenoble, 1865-68.

LEROY, ANDRÉ. "Dictionnaire de Pomologie." 6 vols. 8vo. Paris, 1867-1879.

MAS, ALPHONSE. "Le Verger . . ." 8 vols. col. pls. Paris (1865-1874 ?).

— "Pomologie Générale." 12 vols. 4to. Paris, 1872-1883.

ANON. "Les Meilleurs Fruits au Début du XX^e Siècle." 8vo. 1 vol. [1907 ?].

— "Catalogue descriptif des Fruits adoptés par le Congrès Pomologique." 1 vol. 8vo. Lyon, 1887; Suppl. 1896.

4. GERMAN.

MAYER, J. "Pomona Franconica." 3 vols. 4to. 253 col. pls. Nürnberg, 1776-1801.

MANGER, H. L. "Vollständige Anleitung zu einer systematischen Pomologie." 1 vol. folio. Leipzig, 1780.

KRAFT, JOHANN. "Pomona Austriaca." 2 vols. folio. 200 col. pls. Vienna, 1790-96.

CHRIST, J. L. "Vollständige Pomologie." 2 vols. 50 col. pls. Frankfurt, 1809-13.

DIEL, A. F. A. "Versuch einer systematischen Beschreibung . . . Kernobstsorten." 24 vols. 8vo. Frankfurt, 1799-1825.

BARON VON AEHRENTHAL. "Deutschlands Kernobstsorten." 3 vols. 4to. 98 col. pls. Leitmeritz, 1833-42.

DITTRICH, J. G. "Systematisches Handbuch der Obstkunde." 2 vols. 8vo. Jena, 1837.

LANGETHAL, L. E. "Deutsches Obstcabinet in naturgetreuen fein colorirten Abbildungen." 4to. Jena, 1855-6-7-8 (? 1853-60).

HINKERT, J. W. "Systematisch-geordnetes Handbuch der Pomologie." 3 vols. 8vo. Munich, 1836.

DOCHNAHL, F. J. "Der sichere Führer in der Obstkunde." 4 vols. 8vo. Nürnberg, 1855-60.

JAHN, LUCAS, UND OBERDIECK. "Illustriertes Handbuch der Obstkunde." 8 vols. 1850-75, and three extra vols. "Zusätze und Berichtigungen zu Bänder I. und IV.," by J. Oberdieck, 1 vol. 8vo. 1868; Supplement "Birnen," Lucas and Oberdieck, Stuttgart, 1879. 1 vol. 8vo.; and Lauche's Erster Ergänzungsband, Berlin, 1883. 1 vol. 8vo.

LAUCHE, W. "Deutsche Pomologie." 6 vols. 8vo. 300 col. pls. Berlin, 1882-3.

5. BELGIAN.

BIVORT, A. "Album de Pomologie." 4 vols. folio. Bruxelles, 1847-51.

BAVAY, L., ROYER, A., AND OTHERS. "Annales de Pomologie Belge et Étrangère." 8 vols. folio. Brussels, 1853-60.

6. ITALIAN.

GALLESIO, G. "Pomona Italiana." 3 vols. folio. 172 col. pls. Pisa, 1817-39.

MOLON, G. "Pomologia." 1 vol. 12mo. Milan, 1901.

7. RUSSIAN.

USSIKOV. "Kratkaya Pomologia." 1 vol. 8vo. Petrograd, 1900.

SIMIRENKO, LEON. "Pomologie." 1 vol. 8vo. 1901.

GREBNITZKY. "Atlas Plodov." 4 vols. large 8vo. 100 col. pls. Petrograd, 1903-7.

8. PORTUGUESE.

OLIVIERA. "Diccionario das Peras Portuguezas." 8vo. Oporto, 1879.

9. SPANISH.

PÉREZ, JOSÉ. "Pomona de la Provincia de Murcia." 1 vol. 4to. Madrid, 1884.

10. DUTCH.

KNOOP, J. H. "Pomologia." 2 vols. folio, col. pls. Leeuwarden, 1758.

VAN NOORT. "Pomologia Batava." 1 vol. Leiden, 1830-40.

OTTOLANDER AND OTHERS. "Nederlandsche Boomgard." 2 vols. 4to. Boskoop, 1868.

II. SWISS.

ANON. "Schweizerische Obstsorten." 2 vols. oblong folio, col. pls. St. Gallen, 1866, 1872. Vol. 1. Apples; vol. 2. Pears.

II. SPECIAL MONOGRAPHS ON VARIOUS HARDY FRUITS.

1. THE APPLE.

RONALDS. "Pyrus Malus Brentfordiensis." See p. 433.

HOGG AND BULL. "The Herefordshire Pomona." See p. 435.

HOGG, R. "The Apple and its Varieties." 1 vol. 8vo. 3 illus. London, 1851. See p. 434.

ENGELBRECHT, TH. "Deutschlands Apfelsorten." See p. 426.

BARRON, A. F. "British Apples." Report of the Committee of the National Apple Congress. 5 pls. 8vo. London, 1884.

BEACH, S. A. "The Apples of New York." 2 vols. 8vo., col. pls. Albany, 1905. See p. 438.

RAGAN, W. H. "Nomenclature of the Apple." Washington, 1905.

ANON. "Unsere besten Deutschen Obstsorten." Vol. 1. "Apples." 4to, 41 col. pls. Wiesbaden (1914?).

2. THE APRICOT.

THOMPSON, R. "Apricot. A report upon the Varieties of the, cultivated in the Gardens of the Horticultural Society." See R.H.S. Transactions, Series II. vol. 1. p. 56-74.

LAUCHE, W. "Deutsche Pomologie." See p. 426.

MAS, A. "Le Verger." See p. 430.

3. BUSH FRUITS.

DOCHNAHL, F. J. "Der sichere Führer in der Obstkunde," vol. iv. 1860. See p. 425.

PUCCI, A. "Frutti Minori, Fragole, Poponi, Ribes, Uva spina, e Lamponi." 18mo. 96 figs. Milano, 1895.

LEBL, M. "Anzucht und Kultur der Johannisbeere, Stachelbeere, Himbeere &c. . . und der Bereitung der Beerenweine." Illus. No date. (Modern.)

VERCIER, J. "Le Cassis, son Histoire, sa Culture, etc." Brochure, 76 pp. 12 figs. (Modern.)

CARD, F. W. "Bush-Fruits. A Horticultural Monograph of Raspberries, Blackberries, Dewberries, Currants, Gooseberries, and other shrub-like Fruits." New York, 1907 (4th ed.). 1 vol. 8vo. Many illus.

JUNGE, E. "Unser Beerenobst in Feld und Garten." Roy. 8vo. 27 col. pls. 66 figs. Wiesbaden (1913?).

4. THE CHERRY.

TRUCHSESS, C. F. "Systematische Classification und Beschreibung der Kirschenarten." 1 vol. 8vo. Stuttgart, 1819.

THOMPSON, R. "A Report upon the principal Varieties of the Cherry cultivated in the Gardens of the Society." H.S. Transactions, Series II. vol. i. pp. 248-294.

DE MORTILLET. "Les Meilleurs Fruits." Vol. ii. See p. 428.

5. THE FIG.

GALLESIO, G. "Pomona Italiana. Parte scientifica." First fascicle on the Fig. 1 vol. 8vo. Pisa, 1820.

EISEN, G. "The Fig, its History, Culture, and Curing, with a Descriptive Catalogue of the Known Varieties of Fig." Washington, 1901.

RAVASINI, R. "Die Feigenbäume Italiens und ihre Beziehungen zu einander." 1 table, 61 illus. Bern, 1911. (Historical, caprification, and marketing.)

6. THE MULBERRY.

PANIAGNA, D. JOSÉ. "Del Cultivo especial de la Morera y de sus Variedades." 8vo. Logroño, 1841.

SERINGE, N. C. "Description, Culture, et Taille des Mûriers, leurs espèces et leurs variétés." 2 vols. 8vo. Paris, 1855.

GUILLAUD, EUGÈNE. "L'Olivier et le Mûrier. Histoire, Culture, Parasites." 8vo. Paris, 1899.

7. NUTS—COBNUITS AND FILBERTS (*Corylus Avellana*).

DOCHNAHL, F. J. "Der sichere Führer in der Obstkunde," vol. iv, 1860. See p. 425.

GOESCHKE, FRANZ. "Die Haselnuss, ihre Arten und ihre Kultur." 1 vol. 4to. Berlin, 1887. 76 plain pls.

"Deutsches Obstkabinet." See p. 425.

8. NUTS, WALNUTS.

HENRY, L., AND GIFFEY, C. "Le Noyer." Brochure, 18mo. Modern.

FALLOT, B. "Le Noyer et ses Produits, Noix, Huile, Torteaux." Paris, 1 vol. 8vo. (1900?)

SMITH, R. E. "Walnut Culture in California." University of California Bull. No. 231. 1 vol. 8vo. 1912.

LAKE, E. R. "The Persian Walnut Industry of the United States." U.S. Dept. Agriculture Bull. No. 250. Washington, 1913.

(This and the work of R. E. Smith contain good descriptions and photographs of the different varieties of walnuts, both European and American.)

9. THE PEACH.

LINDLEY, G. "A Classification of Peaches and Nectarines." H.S. Transactions, vol. v. pp. 525-560.

CARRIÈRE, E. A. "Description et Classification des Variétés de Pêchers et de Brugnonniers." 1 vol. 8vo. Paris. (No date; about 1885?)

STOLL, R. "Die Amerikanischen Frühpflirsche, mit Berücksichtigung der Frühpflirsche überhaupt." 1 vol. 8vo. 14 col. pls. Klosterneuberg, 1889 (Good plates and descriptions of the American early peaches.)

10. THE PEAR.

CRAIG, J. "Oriental Pears (*Pyrus sinensis*) and their Hybrids." Cornell University Bull. No. 332.

DECAISNE, J. "Le Jardin Fruitier." See p. 428.

DU MORIER, J. B. C. "Pomone Tournaisienne." 1 vol. 8vo. Tournay, 1869. (History of Belgian Pears and their raisers.)

GILBERT, CH. "Les Fruits Belges" (in Journal of the Royal Linnean Society of Belgium), 1874. (Largely occupied with Belgian pears.)

BARRON, A. F. "Report of the Committee of the National Pear Conference," R.H.S. Journal, vol. ix. 1887.

RAGAN, W. H. "Nomenclature of the Pear. A Catalogue Index of the known Varieties referred to in American publications from 1804 to 1907." 1 vol. 8vo. Washington, 1908.

11. THE PLUM.

GUENDERRODE UND BORKHAUSEN. "Die Pflaumen." 8vo. Darmstadt, 1804-08. (Describes 36 plums, with col. pls.)

LIEGEL, G. "Systematische Anleitung zur Kenntniss der Pflaumen." 2 vols. 1838-44.

BAILEY, L. H. "Reports upon Japanese Plums." Cornell University Reports, Bull. Nos. 13, 62, 106, and 175.

WAUGH, W. "Plums and Plum Culture. A Monograph of the Plums cultivated and indigenous in North America." 8vo. New York, 1910.

HEDRICK, U. P. "The Plums of New York." 1 vol. 4to. col. pls. Albany, 1911. See p. 438.

12. THE STRAWBERRY.

DUCHESNE FILS. "Histoire Naturelle des Fraisières." 8vo. Paris, 1766.

BARNET, JAMES. "An Account and Description of the different Varieties of Strawberries which have been cultivated and examined in the Garden of the Horticultural Society." H.S. Transactions, vol. vi. 1824.

VILMORIN, MADAME ELISA. "Le Jardin Fruitier du Muséum." 1857.

LAMBERTYE, COMTE LÉONCE DE. "Le Fraisier, sa Botanique, son Histoire sa Culture." 8vo. Paris, 1863.

GLOEDE, FERDINAND. "Les Bonnes Fraises." 12mo. Paris, 1865.

REGEL, DR. E. "Die Himbeere und Erdbeere." 1866.

GOESCHKE, FRANZ. "Das Buch der Erdbeeren." 8vo. Berlin, 1874.

MILLET, A. "Le Fraisiers." 8vo. Paris, 1898.

LAXTON, BROTHERS. "The Strawberry Manual." (No date; recent.)

13. THE VINE.

BARRON, A. F. "Vines and Vine Culture, being a Treatise on the Cultivation of the Grape-vine, with Descriptions of the principal Varieties." 8vo. illus. London, 1883.

HEDRICK, U. P. "The Grapes of New York." 1 vol. 4to. col. pls. Albany, 1908. See p. 438.

14. GENERAL CATALOGUES AND REFERENCE WORKS.

"Catalogue of Fruits cultivated in the Garden of the Horticultural Society." 8vo. London, 1826. 2nd ed. 1831; 3rd ed. 1842; suppl. 1853.

"Catalogo Speciale della Collezione di Alberi fruttiferi della Società Toscana d'Orticoltura." 8vo. 1862.

SIMON-LOUIS FRÈRES. "Guide Pratique de l'Amateur de Fruits." 8vo. Paris, 1876. See p. 430.

MATHIEU, CARL. "Nomenclator Pomologicus." 8vo. Berlin, 1889. See p. 427.

BUNYARD, E. A. "An Index to Illustrations of Apples." *Journal of the Royal Horticultural Society*, vol. xxxvii. pp. 152-174. (References to coloured plates of the principal pomologies.)

BUNYARD, E. A. "An Index to Illustrations of Pears." *Journal R.H.S.*, vol. xxxvii. pp. 321-349.

15. GRAFTING AND BUDDING.

WARDLE, WILLIAM. "The Scientific and Profitable Culture of Fruit Trees, including choice of Trees, Planting, Grafting, Training, Restoration of unfruitful Trees, &c." Illustrated. From the French of M. Du Breuil, adapted by William Wardle. 8vo. London, 1862. 2nd ed. 1872; 5th ed. (recent) revised by George Glenny, 8vo.

BALTET, CHARLES. "The Art of Grafting and Budding." Translated from the French of Charles Baltet. 8vo. London, 1873. 5th ed. London, 1903.

THOUIN, A. "Monographie des Greffes, ou Description technique des diverses sortes de Greffes employées pour la Multiplication des Végétaux." 8vo. Paris, ca. 1821.

BALTET, CHARLES. "L'Art de Greffer." 8vo. Paris, 1869. Recent editions in 1892 and 1898.

NOISETTE, LOUIS. "Traité Complet de la Greffe (suivi de l'essai sur la greffe (l'herbe, des plantes et des arbres, par le Baron Tschudy)." 12mo. Paris, 1852. 2nd ed.)

CARRIÈRE, E. A. "Guide Pratique du Jardinier multiplicateur, ou Art de propager les Végétaux par semis, boutures, greffes, etc." 12mo. Paris, 1856.

MOTTET, S. "Guide Élémentaire de Multiplication des Végétaux." 12mo. Paris, 1895.

16. PRUNING AND TRAINING.

FORNEY, E. "La Taille des Arbres fruitiers." 2 vols. 18mo. 680 pages, 349 figs. Paris, 1889.

LUCAS, EDWARD. "Die Lehre vom Baumschnitt." 4 tables, 256 illustrations. 8th ed. Stuttgart, 1909.

VERCIER, J. "L'Arboriculture fruitière en images." 1 vol. 8vo. 101 plates. Paris. (No date; recent.)

UDALE, J. "Handy Book of Pruning." 8vo. Evesham, 1909. Illustrated.

ANON. "Pruning: a Series of Articles for Commercial Fruit-growers." (Lockwood Press.) London (1912?).

17. CULTURE UNDER GLASS.

RIVERS, THOMAS. "The Orchard House; or the Cultivation of Fruit Trees under Glass." 8vo. 1 vol. 1851, and numerous later editions.

THOMSON, D. "Handy Book of Fruit Culture under Glass." 1 vol. 8vo. Edinburgh and London, 1873. (Treats of Pine-apples, Vines, Peaches, Nectarines, Figs, &c.)

PYNAERT, ED. "Les Serres Vergers." 1 vol. 8vo. 134 figs. and 3 plates. (4th edition.) Gand, 1888.

LECOLIER, P. "Culture Rationnelle des Arbres fruitiers en Pots." Brochure. illus. (Modern.)

BRACE, J. "The Culture of Fruit Trees in Pots." 8vo. illus. London, 1904.

18. FRUIT FARMING.

BUNYARD, GEORGE. "Fruit Farming for Profit." 1 vol. 8vo. illus.

GOETHE, R. "Deutscher Obstbau." 1 vol. 8vo. illus. Berlin, 1909.

HOOPER, C. H., AND OTHERS. "Fruit Farming, Practical and Scientific." 1 vol. 8vo. illus. London, 1913.

DURAND, E. "La Culture fruitière moderne: Production, Commerce, et Utilisation des Fruits." 1 vol. 16mo. 28 figs. (Modern.)

WAUGH, F. A. "The American Apple Orchard." 1 vol. 8vo. Illus. New York, 1908.

SEARS, F. C. "Productive Orcharding." 1 vol. 8vo. illus. Philadelphia, 1914.

PASSY, PIERRE. "Traité d'Arboriculture fruitière." 3 vols. illus. 300 figs.

19. GENERAL CULTURAL WORKS.

BUNYARD, GEORGE, AND THOMAS, OWEN. "The Fruit Garden." 1 vol. 8vo. London, 1904.

SANDERS, T. W. "Fruit and its Cultivation." 1 vol. 8vo. London, 1913.

GAUCHER, N. "Handbuch der Obstkultur." See p. 426.

— "Obstbaukunde." 1 vol. Berlin, 1912.

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THE DOUBLE STOCK, ITS HISTORY AND BEHAVIOUR.

LECTURE DELIVERED AT THE MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE IN AUSTRALIA, IN AUGUST 1914. By EDITH R. SAUNDERS, F.L.S., Lecturer and late Fellow Newnham College, Cambridge.

THE double flower is a variation much sought after by the gardener, his aim being to obtain the maximum colour effect within the limits of the number of plants and the amount of space at his disposal. From this point of view the double Stock certainly affords excellent material, for a good double-flowered plant presents an almost solid mass of bloom, and, being particularly an English garden plant, it has associations as well as scent and suitability for mass colour effects in its favour. Even at the beginning of the last century certain strains had been brought to a high degree of perfection. HENRY PHILLIPS,* writing at this time and commending some plants which he had seen exhibited before the Horticultural Society of London, describes them as having flowers "like ropes of Roses." The same writer amusingly recounts the effect which the sight of some Stocks had upon an English gentleman of his acquaintance, who had accompanied him on a visit to Normandy. This gentleman's tastes were so essentially British that nothing in his foreign experiences could please or satisfy him, until, as PHILLIPS relates, the situation was saved in an unlooked-for way. His description of the incident runs thus :—

"The soup was meagre, the pottage was acid, the peas were sweet, the coffee was bitter, the girls were brown, their eyes too black, their caps too high, their petticoats too short, their language an unintelligible jargon, their houses old, their inns dirty, the country too open, the roads too straight ; in short he saw everything with such discontented eyes as to render the party uncomfortable until good fortune led us to a rustic inn, where in a small garden were growing several fine Stocks, which he affirmed were the first good things he had seen since he left Sussex ; and on hearing L'Hôtesse acknowledge them as *Giroflier de Brompton*, he insisted on halting at her house where he treated the party with *un déjeuner à la fourchette*, and left the village with a sprig of the Brompton Stock in his button-hole, his eyes sparkling with champagne and good humour, which lasted for the remainder of the journey, during which time he often said, ' Thanks to the Brompton Stock.' "

As regards the date and place of the first appearance of the double

* *Flora Historica*, vol. ii. (1824), p. 28.

form, we have, so far as I know, no precise record. The single Stock has been cultivated in gardens for probably a far longer period than we are able to trace with certainty. If, working backwards, we search through the works of the herbalists of medieval times, we find that already in the sixteenth century they were quite familiar with the three chief colour forms—purple, red, and white. In the beautiful herbal of FUCHS,* which appeared in 1542, these three strains are all figured, being referred to under the names of *Viola matronalis purpurea*, *punicea*, and *alba* respectively. In RUELIUS' work, however, which appeared only a few years earlier, there is no mention of the red form.† Under the names *Leucoion* or *Viola alba* we find the flowers described as either purple or white. For at this time, it will be recalled, the present name *Matthiola* was not in existence. It was bestowed on the Stock family at a much later date (1812) by ROBERT BROWN ‡ in honour of the celebrated Italian physician and botanist PIERANDREA MATTIOLI (1501-1577). It must be remembered that in the past plants were studied almost solely for their supposed medicinal properties, and hence it is to the works of the physicians of the day that we must turn for our botanical information. By FUCHS, MATTIOLI, and their contemporaries we are referred back through the centuries direct to the famous work of DIOSCORIDES—the “Materia Medica”—which is supposed to have been written in the first century of the Christian era. These writers are generally agreed in identifying both the Stock and the Wallflower as among the plants included by DIOSCORIDES under the name *Leucoion*.

The well-known manuscript copy of DIOSCORIDES' work which was made, it is supposed, in the fifth or sixth century and is now preserved at Vienna, is illustrated by brush drawings, and there is little doubt that the one accompanying the text referring to *Leucoion* is intended to represent the single form of either *Matthiola incana* or *Cheiranthus Cheiri*. In the text mention is made of white as well as yellow and purple flowers, so that we may suppose that even at this time the white variety of *Matthiola incana* was already known; the red form we may conclude, on the other hand, had not yet made its appearance. We are further told that the Stock was especially cultivated by the Greek and Roman matrons for its supposed medicinal properties, though the Wallflower was in more general use for medical purposes.

It is not necessary to state that in these early times there was no clear idea of relationship. Such a conception would not have been

* *De historia stirpium*.

† *De natura stirpium libri tres*, 1536. The colour yellow is given as well, but the reference here is to the Wallflower, then also included under the name *Viola*.

‡ *Hort. Kew. Asit.* ed. 2, vol. iv, 1812. (The Cruciferae are included in the latter part of this volume, for which section of the work it is supposed that R. Brown was responsible.)

compatible with the ideas then current. With the information at their disposal limited to a knowledge of the external appearance of a plant, its habitat and length of life, and with their attention concentrated almost exclusively on its medicinal properties, it will not surprise us that the early writers should group together unrelated forms under the same name. Thus we find the Stock (at this time referred to indifferently under the names *Leucoium* and *Viola alba*, both names signifying white—the description white referring apparently to the appearance of the leaves, and not to the colour of the petals) included together with the Rocket and the Wallflower in the same group as the Violets, on account of the sweet scent characteristic of all the four genera. We may note in passing that the ancients placed the plants included under the name *Viola* third in order of nobility of the flower, the honour of first place being assigned to the Rose, the second to the Lily.

Now in FUCHS' herbal we find no mention of a double Stock. The single, as stated above, is described and figured; apparently, however, it was still somewhat of a rarity in Germany, and was known in German as *welsch Veiel*, the strange or foreign Violet. Nor in the more important botanical works which appeared during the next twenty-five years do we find any record of the existence of the double form. The several later editions of FUCHS' work, BOCK's "Herbal," the earlier works of the celebrated Belgian botanist DODOENS, the various versions of and commentaries on DIOSCORIDES' "Materia Medica" by M. VERGILIUS, AMATUS, RUELLIUS, MATTIOLI, CORNARIUS, CORDUS, LAGUNA, and others appearing between 1529 and 1567, all mention only the single form. The enlarged edition of WILLIAM TURNER's "Herbal," which was completed in 1568, also contains no reference.

It seems clear that the double Stock was not generally known at this date, but such positive evidence as we have indicates that it may have been just about this time that the sport made its appearance.

The first reference to the existence of the double form which I have been able to find dates back to the year to which our investigation has now brought us, viz. 1568. It occurs in a work, dealing with plants having flowers sweet-smelling and suitable for chaplets or garlands, by the Belgian botanist referred to above. DODOENS* speaks of it as a *Leucoium* which multiplies the leaves of the flowers, but which is very rare because it is of the larger sort which begins to flower in the early spring, and hence requires greater care to prevent its being killed by the cold in the winter months, and he adds that it is to be found in gardens. Mention is here made also for the first time, so far as I know, of the double form of the Wallflower. In neither case is there any figure accompanying the text. Illustrations of the double forms of both Stock and Wallflower, or Stock Gilouer and

* *Florum et coronariorum*, &c. For previous reference to Dodoens' work in this connexion see *Reports to the Evolution Committee of the Royal Society*, Rep. II.

Walle Gyllofer, to quote the form under which the English names then appeared, are to be found thirteen years later (1581) in the enlarged Flemish edition of the Herbal of another Belgian botanist, DE L'OBEL,* a contemporary of DODOENS; it is this figure of the double Stock which is repeatedly copied in many of the later Herbals. It is to be noted that from the first moment at which we have any reference to the double Stock we find it depicted as we know it to-day, so fully double as to be absolutely sterile. DODOENS does not mention this fact in regard to the double Stock, though he remarks in passing of the double Wallflower that it is so double as to produce no siliquas, but DE L'OBEL and PENA † state specifically that this is the case in *both* plants. According to their account flowers larger and double follow as the result of special treatment and frequent transplantation; such flowers, they further add, are then, like the Martian (= true) Violet, destitute of seed, and the figures referred to above bear out this statement. Several of DODOENS' contemporaries, notably DALECHAMPS, ‡ CAMERARIUS, § and THEODORUS (TABERNAEMONTANUS) || mention the double Wallflower, and specially allude to the absence in this form of both seeds and siliquas, but none of these three writers appears to have been acquainted at this date with the double Stock, for they make no mention of it. Reference is made to both forms, however, by GASPARD BAUHIN ¶ in 1596, and by GERARDE ** in 1597.

I have thought it of some interest in this connexion to give in the following table a list of some of the botanical works which appeared between 1530 and 1600, arranged in chronological order, so that it may be seen at a glance when and where we meet with mention of the double form of each of the three plants, Violet, Stock, and Wallflower. For, since these three plants were then frequently described together under the name *Viola*, we may suppose that where the double form of one is mentioned that of the others would also be included if it were known to the author.

It will be noticed that in the earliest work quoted—BRUNFELS' "Herbal" (1532 edition)—we find no mention of any of the three doubles. Double Violets are mentioned by C. ESTIENNE (C. STEPHANUS) in 1535, by RUELIUS in 1536, again by ESTIENNE in a later edition of his work in 1545, by DODOENS in 1554, by GESNER in 1560, and in all the later works here quoted. The double Wallflower, like the double Stock, appears first in this list in 1568, but in later works we find that it is frequently mentioned by writers who make no reference to the double Stock. Towards the end of the century both are constantly described.

From the evidence before us we may, I think, safely conclude that

* *Kruidtboeck*, Flemish edition, 1581. See also *Plantarum seu stirpium icones*, 1581.

† *Stirpium adversaria nova*, 1570.

§ *Horius medicus*, 1588.

¶ *Phytopinax*.

‡ *Historia Plantarum*, 1587.

|| *Neuw Kreuterbuch*, 1591.

** *The Herball*.

Date.	Author.	Violet.	Wallflower.	Stock.	Title of Book.
1532	Brunfels	—	—	—	"Herbarum vivae eicones."
1533	Eu. harius (Rhodion)	—	—	—	"Kreutterbüch."
1535	C. Stephanus (C. Estienne)	Doubles	—	—	"De re hortensi libellus."
1536	Ruellius (J. Ruel)	Doubles	—	—	"De natura stirpium libri tres."
1540	Dorstenius	—	—	—	"Botanicon."
1541	Columella	—	—	—	"De rei rustica libri xii."
1541	Gesner	—	—	—	"Historia plantarum."
1542	"	—	—	—	"Catalogus plantarum."
"	Fuchs	—	—	—	"De historia stirpium."
1543	"	—	—	—	"De medicinali materia libri vi."
"	Ruellius—Lonicerus (J. Lonitzer)	—	—	—	"New Kreuterbüch" (also edition of 1555).
1544	Mattioli	(—)	(—)	(—)	"Di Pedacio Dioscoride . . ."
1545	Stephanus (C. Estienne)	Doubles	—	—	"De re hortensi libellus" (later edition).
1546	Tragus (Bock)	—	—	—	"Kreuter Büch" (also edition of 1560).
1551	A. Lonitzer	—	—	—	"Naturalis historiae opus novum."
1553-4	Dodoens	—	—	—	"Trinum prorum [-posterorum] de stirpium . . ."
1554	"	Doubles	—	—	"Cruidtboeck" (also edition of 1563).
1557	Dodoens—Clusius (de l'Ecluse)	Doubles	—	—	"Histoire des plantes" (French version of Dodoens, 1554).
1557	Mizaldus	Doubles	—	—	"Secretorum agri . . ."
1560	"	Doubles	—	—	"De hortis Germaniae."
1561	Cordus—Gesner	Doubles	Doubles	Doubles	"Florum et coronarum . . ."
1568	Dodoens	Doubles	Doubles	Doubles	"Stirpium adversaria nova." (later edition).
1570	de L'Obel and Pena	Doubles*	Doubles	Doubles	"A Nieuwe Herball" (English version of Dodoens, 1554).
1576	"	Doubles	—	Doubles*	"Kruydtboeck."
1578	Dodoens—Lyte	Doubles	Doubles	Doubles	"De plantis libri xvi."
1581	de L'Obel	Doubles	—	—	"Stirpium historiae pentades sex."
1583	Caesalpino	Doubles	Doubles	Doubles	"Herbario Nuovo."
"	Dodoens	Doubles	Doubles	Doubles	"De plantis epitome."
1585	Durante	Doubles	—	Doubles	"Historia generalis plantarum."
1586	Mattioli—J. Camerarius jun.	Doubles	Doubles	Doubles	"Hortus medicus. . ."
1586-7	Dalechamps	Doubles	Doubles	Doubles	"New Kreuterbuch."
1588	J. Camerarius jun.	Doubles	Doubles	Doubles	"Phytopinax."
1590-1	Fabernaemontanus	Doubles	Doubles	Doubles	"The Herball."
1596	C. Bauhinus (G. Bauhin)	Doubles	Doubles	Doubles	"Kreuterbuch."
1597	Gerarde	Doubles	Doubles	Doubles	
1600	Mattioli—J. Camerarius jun.	Doubles	Doubles	Doubles	

* indicates that the plant is figured.

() indicates that Mattioli's first edition was not personally seen by the author.

the double Stock arose under cultivation, conceivably in some Dutch garden ; that, whatever the actual date of its first appearance, it cannot have been in existence long before the date of its first mention by DODOENS (1568) ; that it is probably a more recent sport than the double Wallflower, and certainly than the double Violet. In the light of later knowledge we also readily understand the absence of any statement at this time, even by those who were acquainted with the double plant, concerning its relation to the single, and its origin from seed. Like the double Wallflower, it was, as several writers state, propagated by cuttings. We may remark in passing that the original fully double and quite sterile Wallflower strain has now fallen out of cultivation and is rarely to be seen. The more recently introduced strains produced by German growers, with semi-double flowers capable of being fertilized and setting seed, are more commonly met with.

The flower of the single Stock is that of a typical Crucifer. The floral axis grows but little above the level of the sepals, and forms the usual nearly flat base for the insertion of the floral members. In the double the normal calyx is followed by an indefinite series of petaloid structures, the youngest of which never enlarge or unfold, but form a central bud. For this reason it is difficult to estimate the exact number of petals composing the flower, but from a large number of counts that were made it is evident that the number of those large enough to be removed easily by hand varies within wide limits.* So far as was ascertained these variations bear no relation to the position of the flower on the axis, or to the periods of the flowering season. This large number of petals is borne on an elongation of the axis which extends for some half inch or more above the insertion of the calyx ; the double flower has in fact all the appearance of the terminal bud of an axis capable of unlimited growth, often with many dormant axillary buds such as we see in the compound vegetative bud of Brussels Sprouts. The appearance of this axis after the removal of the petals is suggestive of a spiral arrangement of the members, but according to Goebel † the early stages in development point to a typical whorled arrangement of the normal number of petals and stamens, the latter undergoing repeated splitting.

Once obtained, the double was propagated by cuttings, but how to procure it *de novo* was a mystery, and remained so until Mendelian methods of analysis furnished the explanation. Many attempts were made, however, to solve the problem. Special treatment and methods of culture were believed in and practised. Great faith was placed in frequent transplantation. The advice that this operation should be repeated at frequent intervals was conscientiously copied by one writer

* From observations on this point which were kindly undertaken for me by Miss E. DALE, it was found that in most flowers the number of petals large enough to be removed with the naked eye was usually between 40 and 70. Flowers were occasionally found, however, in which the number fell below 30, or, in the case of the opposite extreme, exceeded 90. In some cases more than one growing point occurs, and in such flowers the number may be higher still.

† *Pringsheim's Jahrbuch*, Bd. 17, 1886.

from another, but we do not meet with any statement as to the practical results obtained. Notwithstanding this absence of proof, instructions given with such minute attention to detail as is to be met with, *e.g.*, in PLAT'S "Garden of Eden," might well allay the suspicions of any inclined to question the efficiency of current methods. These are Sir Hugh's instructions, which we find repeated in editions of his book appearing as late as 1660 (1659) and 1675, given under the marginal heading "Single flowers doubled" *:—

"Remove a plant of Stock-gilliflowers when it is a little woodded and not too greene, and water it presently; doe this three dayes after the full, and remove it twice more before the change. Doe this in barren ground, and likewise three dayes after the new full Moon remove againe, and then remove once more before the change. Then at the third full Moon, *viz.* eight dayes after, remove againe, and set it in very rich ground, and this will make it bring forth a double flower; but if your Stock-gilliflowers once spindle, then you may not remove them. Also, you must shade your plant with boughs for three or four dayes after the first removing; and so of Pinks, Roses, Daysies, Featherfew, etc., that grow single with long standing. Make Tulipees double in this manner. Some think by cutting them at every full Moone before they beare to make them at length to beare double."

Incredible as it may seem to us to-day that such views should have been seriously entertained in recent times, it is evident that this kind of superstition did persist for a considerable period, if, indeed, it is not to be met with occasionally even now.†

Yet the fact that the double Stock is undoubtedly obtained from the seed of singles had already been definitely stated by PARKINSON as early as 1629.‡ In his celebrated "*Paradisus terrestris*" he says:—

"But this you must understand withall, that those plants that beare double flowers doe beare no seede at all, and is very seldome encreased by slipping or cutting as the next kinde of double is: but the onely way to have double flowers any yeare (for this kinde dyeth every winter for the most part after it hath borne flowers, and seldom is preserved) is to save the seedes of those plants of this kinde that beare single flowers, for from that seede will rise some that will beare single and some double flowers, which cannot be distinguished one from another, I meane which will bee single and which double, until you see them in flower, or budde at the least. And this is the onely way to preserve this kinde: but of the seede of the former kinde was never known any double flowers to arise, and therefore you must bee carefull to marke this kinde from the former."

Despite PARKINSON'S statement, the old tradition, as we have seen, lived on. We meet with mention of it again a little later in RAY'S "*Historia Plantarum*" (1686) as a belief held by others; he himself appears to have had an open mind upon this point. Having stated

* p. 85 (5th edition).

† See Chaté, *Culture pratique des Giroflées*, p. 61. (Undated but published between 1858 and 1866.)

‡ p. 261.

as his opinion that the double Wallflower differs in nothing from the single except as the result of cultivation, he goes on to say that the double Stock also differs scarcely at all in appearance from the single, since it arises from it by seed or else (as they say) *through treatment and frequent transplantation*. Early in the eighteenth century we find PARKINSON'S view again upheld, for SALMONS states in his "Herbal" * (1710) that there are also annual species [*i.e.* of Stocks] producing singles and doubles which are propagated by seed from the singles, since the doubles produce no seed. But even at a later date this relation between the two forms was not apparently common knowledge. Possibly the annual strains were not yet in general cultivation, and those acquainted only with the *incana* type would be familiar only with the method of propagation by cuttings. Thus BRADLEY, writing as late as 1728, says of double Stock Gillyflowers "of divers colours" . . . "never bearing seed" . . . "*but must be increased only by the cutting of the young Sprouts or Branches taken in a fit season.*" †

Another cause which no doubt delayed general acceptance of the fact that the double was obtained from the seed of singles was the uncertain results which, as we now know, must have followed the sowing of seed in many cases when the importance of pure breeding was not understood. Sometimes expectation will have been fulfilled, but frequently, no doubt, few or no doubles will have been obtained.

In illustration of this point I may quote the account given by BRADLEY of an experience which came under his notice. BRADLEY was evidently impressed by the facts he relates, which we have no reason to question, though we may not so readily accept his conclusions so far as Stocks are concerned. The account appears at the end of the article entitled "Of Stock July-flowers" in "New Improvements of Planting and Gardening, both philosophical and practical," and is as follows ‡ :—

"I cannot anywhere so properly as in this Place take Notice of an Observation which an ingenious Gentleman has communicated to me concerning the *Seeds of Plants*, and particularly of those of the *Stock July-Flower*. He says that he once bought some *Stock-seed* of a Gardener near *London*, which he sow'd in his Garden in *Oxfordshire*, and brought him great Store of double Flowers; and some few single Ones of an extraordinary Colour and Bigness, which were so much admir'd by the Gardeners round about him, that he was continually solicited for some of their *Seeds*. He sav'd a large Quantity, and supply'd several curious Persons with it. What he gave away maintain'd for the first time of Sowing its first Excellence, but what he sow'd in his own Garden lost its good Qualities. In short, he was now become a Supplicant to those he had set up, and from the *Seeds* they had saved he had his first good Fortune in many *Double Flowers*, while those who had saved the *Seeds* complain'd of their ill Luck, and

* p. 1105.

† See *Dictionarium Botanicum*, under the name "*Leucoium*" (the italics above are mine).

‡ p. 144 in 4th edition (1724).

were apt to say, that if they had not gather'd them with their own Hands, they should have believed they had been impos'd upon ; at last they all agreed mutually to exchange the *Seeds* of this and other Flowers annually, and every one had good Success. This Story, I think, plainly shews how much the Change of Air and Soil contributes to improve some particular *Vegetables*."

It was experiences such as these, no doubt, which gave rise to a theory which, though wide of the truth, gained a certain measure of belief from its apparent soundness and common-sense, and which we find stated in HILL'S well-known work entitled "*Eden, or a Compleat Body of Gardening*" (1757). HILL'S advice to such as desire to have many doubles is as follows :— *

" Let him select such single Stocks for seed as are large, robust, well growing, and would naturally have a vast Multitude of Flowers ; and such as have in some Flowers somewhat above the proper number of Petals, five, six, or more ; this is the first Tendency in Nature to Doubleness ; and this he should carefully watch for the farther Improvement."

This method of procedure is scarcely less laborious and no more successful than that advocated by PLAT, for, as anyone who grows Stocks on a large scale can testify, the flower with one or two extra petals is a variation occurring so rarely as to involve a tedious search, and, as we now know, disappointment will await anyone attempting to obtain doubles by this method from a pure strain of singles. In this connexion the statement of the French horticulturist Chaté, in whose family the cultivation of Stocks and Wallflowers had been carried on for thirty years, is of some interest. In his treatise on the cultivation of these plants he remarks : " I may add as a personal observation that I have met so rarely with plants possessing this fifth petal that it would have been impossible to count upon such a rare phenomenon as a means of procuring seed for my cultures." † It may further be pointed out that not only are individuals with such flowers rare exceptions, but also that the variation may perhaps appear in only one flower, or at most in only a few out of the whole number borne in a season by one individual, and in many years no such abnormal flowers are observed at all. In any case it seems clear that this abnormality has no direct connexion with full doubling and is not inherited.

One writer of the seventeenth century, however, appears to have had a true insight into the matter, for he plainly states the fundamental fact which provides the clue to the whole explanation. In a work entitled "*Flora, Ceres, et Pomona*," which appeared in 1665, written by one JOHN REA, gentleman, who had evidently given some attention to the subject, we find the following passage :—" Neither do the seeds of every single kind (*i.e.* of Stock) produce any double, but if you have good seeds of a right kind, you may from them raise many double

* p. 567.

† *loc. cit.* p. 64.

flowers." He further adds that "the double only is admitted into the gardens of the Curious, the single remaining in some nursery to bear seed." * It is clear, however, that this essential underlying fact that among Stocks there exist two distinct hereditary types of single, viz. those which produce doubles and those which do not, was not generally appreciated until considerably later, and it was ignorance of this fundamental point which delayed the full understanding of such observations as were from time to time recorded, and led to the acceptance of various theories which claimed to account for the appearance of doubles, but which, when tested, proved to have no foundation in fact. As some of these are still current at the present day, it may be worth while to refer briefly to them here. That each of these several hypotheses fails to account for the facts becomes apparent as soon as it is tested by observation and experiment.

Various methods which have been advocated in the past as leading to the production of doubles among Stocks, but which have proved on investigation to be without effect :—

1. The sowing of seeds or the transplantation of young plants at particular phases of the moon. At the present day comment on this method is superfluous.

2. Special treatment (probably of the nature of manuring) and frequent transplantation of young plants. This, as we have seen, was the view held by the earliest writers on the subject. A later form of the same idea, current after it was realized that the doubles were obtained from seed, was that of sowing the seed in a different soil from that in which the parent plants had been grown (BRADLEY, 1728). †

3. The selection as seed-bearers of singles on which were found flowers having one or two extra petals (HILL, 1757).

4. The planting of doubles among or in close proximity to singles, in order that the single plants might, as supposed, be fertilized by pollen from the doubles. This was one of the earliest and most widespread of beliefs held by the gardener. His confidence in the method is illustrated by the following passage from the Herbal of THOMAS GREEN (1820), the matter contained in which is stated on the title-page to be "collected from indisputable authorities." We find under the head *Cheiranthus incanus* (Stock-Gilliflower) the following :—

"A very sure way of obtaining many double flowers, is to make choice of those single flowers which grow near many double ones, for those seeds saved from plants growing in beds close to each other, if there happened to be a good many double flowers among them, have been always found to produce a much greater number of plants with double flowers, than those which have been saved from plants of the same kinds which grow single in the borders of the flower-garden." ‡

* pp. 162, 163.

† References to the works of the writers here mentioned are not repeated where they have been given in the preceding pages. The authors' names are quoted here merely to show the dates at which the different views were current.

‡ *The Universal Herbal*.

We may well believe GREEN's statement that seeds taken from singles appearing among a large number of doubles were found to give in turn many doubles, though the explanation of this fact is not, as he supposed, to be traced to the close proximity in the ground of the two kinds of plants. We find the same instruction in PAXTON's "Botanical Dictionary" in 1868. He says: "In order to obtain good double Stock-gilliflowers, Brompton, and Queen Stocks, choice should be made of such single-flowering plants as grow near many double ones." * Only a year or two ago I myself heard this view strongly maintained by a well-known gardener. But although this suggestion has been constantly repeated by various writers on the subject, they have generally admitted that the occurrence of double flowers with pollen must nevertheless be extremely rare. In fact the impression made on the reader is that the writer is often handing on a tradition, and in no way vouching for the occurrence upon the supposition of which the practice is based. The nearest approach to first-hand evidence that such flowers occur which I have been able to find is contained in the work by PHILLIPS (1824) to which I have already referred. † Having stated that the full flowers never produce seed, he adds: "Yet it is the opinion of most gardeners that they assist in causing the plants to become double, and it will be observed that there is frequently a straggling anther to be found in the double blossoms, which may assist this change by the impregnation of the neighbouring plant." He does not, however, mention whether this anther-like structure had been observed to contain pollen, and if so, whether the pollen appeared to be good. As to both points I think we may feel considerable doubt, but neither need detain us here. For even if such double flowers are occasionally produced, they must be so extremely rare that their existence could have no appreciable effect on the constant production of the large and definite proportion of doubles which we observe. I may add that I myself have never seen any structure remotely resembling an anther in the many hundreds of double flowers which I have examined. A correspondent writing to the "Gardeners' Chronicle" in 1843 says that he found eminent Stock-growers were not aware that the doubles had no pollen, but that when asked by him to examine a flower they agreed that such was the case. ‡ Here, as in the case of the previous method, the very plausibility of the view seems to have led to its ready acceptance without further verification.

5. The selection for sowing of seeds which are small and irregular. (See a paper by THIELE (1825) quoted by GOEBEL, § REGEL || (1852), "Gardeners' Chronicle" ¶ (1859).)

* New edition.

† See p. 29.

‡ p. 678.

§ *Pringsheim's Jahrbuch*, Bd. 17, 1886.

|| *Gartenflora*, 1852, p. 84.

¶ Pp. 51, 52, where an account is given of a paper, translated for the Horticultural Society of Paris by M. Courtin, which had appeared in the *Illustrirte Garten-Zeitung*. According to the author, the best seeds are those which have a very small border, but which are irregular in form, and rather angular, not flat.

It has been suggested by OBERDIECK* that this view arose after the introduction of the new, large-flowered English Summer Stocks, which had larger and more beautiful flowers than the familiar so-called German stocks with shorter pods and more numerous seeds, the seeds of the latter sort being so crowded as to be often compressed by one another. However this may be as regards the origin of a view somewhat widely held, we do not find that the view itself is borne out by the facts. Experiments have shown that, among double-throwing single strains, some with particularly long pods in which practically every seed is regular and flat give as high a proportion of doubles as those with short pods and many small, irregular seeds. And, conversely, some strains may have these short pods and irregular seeds and yet give no doubles at all. Further, if the flat seeds be sorted from the irregular ones in the same pods, an equal proportion of doubles will, on the average, be obtained from both samples.† The irregular shape of the seeds is undoubtedly the result of pressure during development, and the ultimate form of the seed has nothing to do with the singleness or doubleness of the flower which it produces. This flower character, like any other, is, as we now know, determined at the moment of fertilization (see later, p. 406).

6. The selection for sowing of old seed rather than fresh. Advocated by THIELE,‡ BOSSE,§ and CHATÉ,|| and mentioned as a common belief by OBERDIECK.¶ This idea seems to have been held in regard to other plants besides Stocks. (See BOSSE** and FAIRWEATHER†† concerning Balsams.) As the result of experiments on this point BOSSE came to the conclusion that two- or three-year-old Stock seed gave predominantly doubles, current year seed more singles, and that the same was the case with Balsams. He sowed one-year-old and six-year-old Stock seeds in the same bed, and states that the former developed more quickly and gave almost entirely singles; the latter produced only ten among several hundreds of doubles. CHATÉ was of the same opinion. Writing of Stocks, he says that "experience has proved that seeds two years old give more doubles than those one year old." FAIRWEATHER's statement in regard to Balsams is to the same effect. He writes: "The seed of Balsams should not be less than three or four years old when sown; the best double flowers which I have procured this

* *Wiener Illustrirte Garten-Zeitung*, 1879, p. 307.

† See Saunders, "Further Experiments on the Inheritance of 'Doubleness and other Characters in Stocks,'" *Journal of Genetics*, vol. i. 1911, p. 366. Also "Double Flowers," *Jour. of the Roy. Hort. Soc.* vol. xxxviii. 1913, p. 480, where figures are given showing the different form of the seeds in short and long pods respectively.

‡ See Goebel, *loc. cit.*

§ *Verhandl. d. Preuss. Gartenbau-Vereins*, iv. 1828, p. 276; quoted by Bronn in *Handbuch der Geschichte der Natur*, ii. p. 77.

|| *loc. cit.* p. 73.

¶ *loc. cit.*

** *loc. cit.* p. 77.

†† *Trans. Hort. Soc.* vol. iii. p. 406.

season were raised from seed nine years old; and my experience has convinced me that new seed seldom produces double flowers."

Recent experiments designed to test this point in Stocks show, however, that although in one sense there appears to be some truth in this idea, this was evidently not the sense in which these observers intended their statements to be interpreted. As with lapse of time more and more of the seeds lost the power of germination, these writers concluded from their observations that more and more of those that still survived became capable of producing double-flowered plants.* Whereas, what appears to be the case is that seeds destined to give rise to singles lose the power of germination somewhat earlier, on the whole, than seeds yielding double-flowered plants. Hence any increase in the proportion of doubles obtained from old seed is to be attributed, not to any change gradually effected in course of time in the surviving seed, but to the slightly greater viability of the double-producing seed. The capacity of a seed to develop into a double or a single, as already stated, is a fixed quality, not alterable by environment or treatment.

7. Reduction of the number of pods which are allowed to mature either by removal of the weaker flowering branches (advocated by CHATÉ),† or as the result of castration (method of MESSER,‡ quoted by BRONN§ and VERLOT and referred to by CHATÉ,|| who emphasizes the impracticability of carrying out this latter method on a large scale, while BRONN adds that MESSER'S results were not confirmed by KRESS¶).

8. Cultivation under conditions which prevent luxuriant growth, as, *e.g.*, by the method of pot culture with a minimum amount of watering. (Method adopted by German cultivators.)

Both these methods (7 and 8) aim at the same result—a limited production of seed, but achieve it by diametrically opposite means. In the one case the maximum amount of nourishment is distributed among a diminished number of pods, and in the other the production of a small number of well-ripened pods is obtained by a method of starvation. Both are found, however, to be equally without effect on the production of doubles which, as, previously stated, is independent of methods of nutrition.

9. Selection for sowing of seed from localized regions of the mother-plant, as, *e.g.*, from the lower part of the pod, the upper portion being discarded before the seed is extracted (advocated by CHATÉ)**; or from siliques which are clustered close together in twos or threes on the axis, in preference to those which occur singly and far apart.

* See Chaté, *loc. cit.* p. 73.

† *loc. cit.* p. 72.

‡ "Die Kunst unfehlbar gefüllte Levkoyen zu ziehen." *Verhandl. d. Preuss. Gartenbau-Vereins*, v. 1829, p. 181.

§ *loc. cit.* p. 77.

|| *loc. cit.* p. 64.

¶ *Verhandl. d. Preuss. Gartenbau-Vereins*, viii. 1832, p. 232.

** *loc. cit.* pp. 73, 74, and 80.]

(Mentioned by DECAISNE and NAUDIN * as a practice among French gardeners.) CHATÉ states that he drew his conclusion from the results he obtained on saving the seeds from the upper and lower ends of the pods separately. I have repeated CHATÉ's experiments. but I have not found that the results give any confirmation of his view. The proportion of doubles obtained from the two halves of the pods was found, on the average, to be the same, an excess of singles sometimes obtained from seeds taken from the lower end being counterbalanced another time by an excess among plants which had been grown from seed taken from the top end.† The greater number of doubles obtained by CHATÉ from the lower ends of the pods was no doubt accidental, and would not have held good if the experiment had been carried out on a large enough scale.

The same explanation probably accounts for the view quoted by NAUDIN and DECAISNE, if indeed it had any foundation in fact. In this connexion I may remark that in the Stock it is not unusual to find what appears to be a very irregular distribution of the doubling factors among the ovules of individual pods; hence a large sowing is often essential in order to determine whether the result obtained from a sample sowing represents the true ratio, or an accidental departure from that ratio.

10. Selection for sowing of seed harvested from a summer-flowering Stock which has survived the winter (mentioned by OBERDIECK).‡ This view again presupposes that the double character is one capable of being produced as a direct result of a change in environmental conditions, and therefore need not be further discussed.

11. Selection of those seedlings which arise from energetically germinating seed (*e.g.* seed germinating in three to four days), and the discarding of those of the same sorts which germinate slowly (*e.g.* seed taking nine to ten days to germinate) (advocated by NOBBE, § 1887). I am unable to decide from NOBBE's account whether he holds that the *rate of germination in itself* has an effect on the double character, of such a nature, that in some cases a seed germinating very slowly produces a single, which, if it had germinated more quickly, would have given rise to a double; or whether his statements are to be interpreted as meaning that the embryos of seeds destined to produce doubles are capable of more rapid germination than those of seeds which will give rise to singles. The first-mentioned supposition falls into the same category as the views given under 7, 8, and 10, and may be dismissed for the same reasons. As regards the second possibility—that the germination of seeds which will in any case produce doubles, as compared with seed which will give singles, is more rapid—I am disposed to think it unlikely, and that in any case NOBBE's observation is not on a sufficiently large scale to be conclusive. To obtain perfectly

* *Manuel de l'Amateur des Jardins*, Paris, 1862.

† See Saunders, "The Breeding of Double Flowers," *IV^e Conférence Internationale de Génétique (Comptes rendus et Rapports)*, Paris, 1911.

‡ *loc. cit.*

§ *Bot. Centralblatt*, Bd. 32, 1887, p. 253.

equal conditions, even as between seeds grown in the same pot and apparently all equally well ripened, is a difficult matter ; when this is taken into account, as well as the fact that seed even in the same pod is not always equally " good," it will be clear that differences in the rate of germination are likely to occur quite apart from the single- or double-producing quality already pre-existing in the seed. Further, it may often be noticed that in a pot full of seedlings there are perhaps only one or two laggards, whereas nearly half the total number in the pot will develop into singles. Various sources of error would have to be very carefully eliminated before statistics on this point could be regarded as proving an inherent difference in germinating energy between seeds giving rise to singles and doubles respectively. To the possibility, however, that doubles are sometimes, at some stage in their development, more precocious than the singles is a point to which I shall return later.

12. The method of *essimplage* practised by French gardeners (advocated by CHATÉ). This method is based on the view that it is possible to distinguish singles and doubles when quite young by their vegetative characters. By this means it is claimed that a considerable saving to the cultivator is effected, since he need not grow so many plants to maturity which are useless from the market point of view. According to CHATÉ* the leaves of the singles are dark green, shining in the wallflower-leaved forms, and rounded at the apex ; the heart, *i.e.* the centre of the leaf rosette, is of shuttlecock form, and the plant is of a stumpy and compact habit. In the doubles the leaves are very long, of a pale green, and curled at the edges. The central leaves are whitish and rolled, and form a closed heart. He adds that these characters are well marked, and with practice they become easily recognizable at the first glance. It is far more probable, however, that these differences are features which distinguish one strain from another rather than the singles from the doubles in any one strain. We know this to be so in the case of one of the characters cited, *viz.* that appearance of the leaf surface which is quite unconnected with singleness and doubleness, as high a proportion of doubles being obtained from the wallflower-leaved forms with their glossy deep green leaves as from the hoary types which have leaves of a greyish green. And the same is almost certainly the case as regards leaf-shape and the general habit of the plant. Moreover, as VILMORIN† has pointed out, the method is not practicable where many different strains are cultivated, each of which may be characterized, in the singles and doubles equally, by certain slight differences in habit and leaf form. For my own part, I may add that, after many years' experience, I do not find myself able by this method to distinguish with certainty between the future singles and doubles. In the absence of any experimental data in

* *loc. cit.* p. 67.

† *Les Fleurs de pleine terre.* (See under *Giroflée*.)

support of CHATÉ's view, it seems scarcely profitable to discuss it further.

13. Selection of seed from pods which are quite closed at the apex, those being discarded which are open or only half closed at the upper end (suggested by PAPANCK).* This idea is purely speculative ; as the author naively explains, selection based on differences in the seed characters is difficult to carry out, and he therefore directed his attention, not, like Professor NOBBE, to the seeds, but to the pods, since, if differences in pod characters were found to be associated with singleness and doubleness in the plants derived from them, this distinction would afford a practicable method of selection. From the results of his first experiment he was disposed to think that doubles were produced by seeds from the closed pods, singles from those that were open, but adds that he did not regard this first experiment as conclusive. Confirmation of this suggestion was not obtained, as an accident prevented the carrying through of a second test. A side point noticed by PAPANCK was that seeds from closed pods appeared to germinate three or four days later than those from open ones. This works out, on PAPANCK'S view, that the doubles germinate more slowly than the singles, whereas NOBBE came to the opposite conclusion. This view of PAPANCK'S, however, which is admittedly purely speculative and supported only by very slight evidence which he himself hesitated to accept, I think we may very well leave out of account, regarding it as merely one more of the many unsuccessful attempts to find in some general outward and visible sign an indication of a character already determined, but not yet apparent in the embryo.

Before leaving the subject of the possibility of identifying the future doubles by the seed characters, I may add that so far as my experience goes this is only feasible in one strain, viz. the sulphur-white, and only in one of the races belonging to this strain. The sulphur-whites are of special interest from the fact that they are not only ever-sporting as regards singleness and doubleness, but also as regards flower colour ; and further, on account of a certain coupling of the plastid colour character with singleness and doubleness. The singles are white, both sap and plastids being colourless ; a very few of the doubles are also white, but almost all are cream, owing to the presence of cream-coloured plastids in a colourless sap. This strain is found both with the small lumpy seeds characteristic of the ordinary true-breeding white, and with the large rounded flat seeds characteristic of the true-breeding cream. In this latter case two shades of colour may be distinguished in well-ripened seeds, one brighter and yellower, the other duller and browner. On sorting the seeds into these two classes it was found that the creams, and therefore nearly all the doubles, were produced by the yellower seeds ; the whites, and therefore almost exclusively singles, from the browner seeds. By this method of sorting it is therefore possible in this case to obtain a fairly complete separation of the doubles from the singles. The actual numbers recorded in the single experiment

* *Wiener Illustrierte Garten-Zeitung*, 1890, p. 389.

in which this method was tried have been given in an earlier account.*

We reach this point then, that in so far as the views here discussed are not based on the fundamental fact which we must now regard as established, viz. that the single or double nature of the future Stock flower is already determined at the moment of fertilization, and, like other inherited characters, is laid down in the seed, we need not concern ourselves further with them. The suggestion that this might be found to be the true explanation had been thrown out earlier by OBERDIECK † (1879), and is again mentioned later by GOEBEL ‡ (1886), but proof was lacking, the position hitherto being rather of that negative order that where every other suggestion had failed, possibly this one might be true. As soon as breeding tests were applied, however, it became evident that the production of doubles was a regular and orderly phenomenon. The Mendelian method of analysis—the essence of which is to investigate, not strains as a whole, however homogeneous they may appear to be, and not collections of individuals, however small, but each particular individual separately—provides us with a means of elucidating the real conditions upon which the appearance of doubles depends, and thus explains the perplexing behaviour of the Stock in regard to this character.

In the first place it must be understood that in the two cultivated Stock forms *incana* and *annua* there are to be found among the populations in our gardens to-day, not merely singles and doubles, but *two fundamentally distinct* types of singles. As I conceive it, there must have arisen some two hundred and fifty years back at least, and possibly longer ago, from what cause we do not know, a new type of single, not differing in outward appearance in any way from the ordinary individuals of the species, but having a different gametic constitution—a constitution that resulted in the production of ovules and pollen grains of a different character from those of the original ordinary single. By some process of evolution the species thus became heterogeneous, and as a direct result of this variation there arose the double—a form constantly thrown by the new type of single, which is therefore termed ever-sporting, in contrast with the original type, which is pure-breeding. Thus we arrive at a species having as constant type-elements the following forms:—

1. Singles, whose gametic constitution is such that their posterity in all succeeding generations are single also.
2. Singles, whose gametic constitution is such that they yield a mixture of doubles and singles, the doubles being in a slight majority and altogether sterile, the singles in each succeeding generation giving again a mixture of singles and doubles.
3. Doubles, which, as stated, are incapable of producing offspring.

* See Saunders, *Journal of Genetics*, vol. i. No. 4, p. 366, 1911. Also *Journal Roy. Hort. Soc.* vol. xxxviii. p. 481.

† *loc. cit.*

‡ *loc. cit.*

It follows :—

1. That where only strains of the first type are grown, so that intercrossing with plants of type (2) cannot take place, no doubles will be obtained, whatever the method of cultivation, save by variation *de novo*.

2. That where strains of type (2) only are cultivated, and under conditions where interbreeding with plants of type (1) does not occur, a constant average proportion of doubles, slightly in excess of the singles, will be automatically maintained, apart from selection or special treatment.

Such are the patent facts, easily verifiable at a minimum expenditure of labour and patience. Now to consider the underlying cause, the inner nature or constitution of the two kinds of singles, which is accountable for their different behaviour.

The *true-breeding* single we may picture as containing factors—we have reason to suppose that there are at least two and that they are in some way linked together—which in conjunction determine the single character of the flower. Each individual has been derived from a pollen grain and an ovule containing these factors. In constitution each such individual is homozygous in respect of these factors. It will produce in turn pollen grains and ovules each containing these same factors, and all its posterity in each succeeding generation will therefore be single.

The *ever-sporting* single is a heterozygous individual as regards these factors. We may suppose that in the first ever-sporting individual, at some stage in the sequence of cell division, there occurred an irregularity in the normal symmetrical process, resulting in the formation of some cells in which these factors were lacking. These deficient cells are the producers of a certain number of the ovules, and the whole number (without exception so far as we know at present) of the pollen grains. It follows that the offspring of such an individual will be derived in two ways : sometimes from the union of an ovule containing the factors for singleness with a pollen grain that does not ; sometimes from an ovule from which, as well as from the pollen grain, one or more of these factors is absent. In the latter case, where both the contributing germ cells are without the factors for singleness, the resulting individual is a double. Being sterile, the double leads us no further ; it forms a dead end in the genealogical tree. In the other case, where the factors for singleness are received from one side of the pedigree but not from the other, a heterozygous single results ; each such single is found to behave like its single parent and gives again a mixture of singles and doubles, and so on through succeeding generations.

The evidence upon which these conclusions are based is derived from numerous experiments in cross-breeding, and has already been given elsewhere.* Briefly put, it is as follows :—

Where a pure-breeding single of the type described above is crossed with pollen from an ever-sporting single, the resulting plants are

* See *Journal of Genetics*, *loc. cit.*

singles, and every such single gives in the next generation a mixture of singles and doubles, the proportion being on the average three singles to one double.

Where the cross is made in the reverse way, the ever-sporting single being used as the female parent and the pure-breeding type as the male, the offspring are again all single, but of two kinds in respect of behaviour. Rather less than half yield posterity which in each generation are all single; rather more than half give a mixture of singles and doubles in the proportion on the average of about three singles to one double, and these singles are again of two kinds, as in the first generation derived from this cross.

We may express these results graphically as in the Table II. on p. 469:—

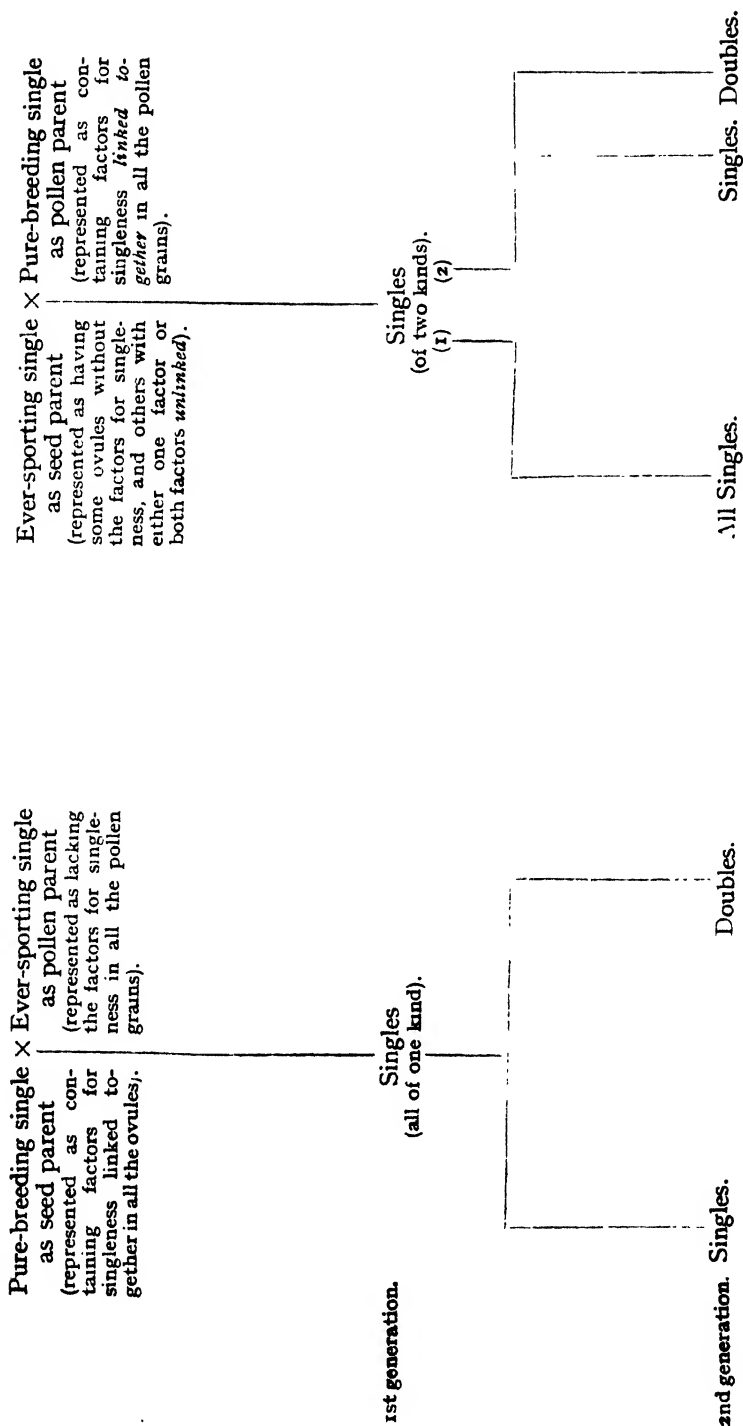
The foregoing considerations have shown that it is essential for the maintenance of a high percentage of doubles that the initial material should consist entirely of ever-sporting individuals, since the effect of intercrossing with pure-breeding or cross-bred individuals will be always in the direction of lowering the proportion of doubles. And further, that once such a culture of ever-sporting individuals is obtained the percentage of doubles will be automatically maintained irrespective of the method of cultivation so long as interbreeding with pure-breeding or cross-bred singles does not occur. If these two conditions are fulfilled the grower may count on the maximum return in the way of doubles without further intervention on his part. The question which he will naturally ask at once is—What is this maximum? The answer to this question presented a problem of vital and perennial interest to the gardener so long as the belief remained unshaken that this maximum depended upon environmental conditions, and might be increased artificially by appropriate means, if they could only be discovered. Now that we know that the output of doubles is definite, that it is an inherent character of the plant, the solution of this problem lies with the student of genetics rather than of horticulture.

Considering the very haphazard results that must have been obtained by the early horticulturists (see above, p. 457), it is not surprising that we meet with few generalizations in their accounts of Stocks as to the relative proportion of singles and doubles. In an *Histoire des Plantes de l'Europe* which appeared in 1689 it is stated under the head of *Leucoium album* that the plants are of different colours, white, red, and yellow (yellow here refers, as usual, to the Wallflower), and that all three are to be found in gardens, *as many doubles as singles*. Here we have a very close approximation to the truth. GREEN,* speaking of the biennial forms of the Stock-Gilliflower, says that "if the seeds be well chosen three-fourths of the plants will probably be double." This may be merely a rough estimate, erring in the direction of a too great excess; even if, as is unlikely, it is based on counts from the flower-beds, we may still, as we shall see presently, hesitate to accept it, without further evidence, as a reliable indication of the actual output of doubles. CHATÉ† quotes 50 per cent. as usual for a number

* * *loc. cit.*

† *loc. cit.*

TABLE II.



of different strains, but claims that by his method (see above, p. 462) this can be increased to 70 or 80 per cent.

So far as my experience goes, the actual output of doubles yielded by the different ever-sporting strains is the same for all ; as stated above, it remains constant, and may be put at about 53 or 57 per cent. It will suffice to state here that this estimate is based on numerous observations carried on through a number of years. A full account of the experiments and a discussion of the theoretical conclusions to be deduced therefrom regarding the gametic constitution of these forms will be found elsewhere.* But if this proportion represents the maximum output which we are unable artificially to increase, it remains to consider if there is any method by which we can circumvent Nature's limit, and so achieve a better result in our flower-beds.

Certain observations made in the course of the last year or two have convinced me that in some cases at all events this can be done. I had noticed that the proportion of doubles to be seen in the flower-beds of a College garden in Cambridge appeared to be far in excess of expectation. Careful counts fully confirmed this observation. The doubles were undoubtedly enormously in excess of the singles. Either the strain in question—a magnificent intermediate hoary white—must be quite exceptional in the matter of output of doubles and in this respect differ from all strains previously investigated, or the excess must be due to some process of selection. The counts made in four successive years gave the proportion of doubles shown below—a proportion which in each case far surpasses the 53 or 57 per cent. of expectation.

Date.	Number of Singles.	Number of Doubles.			
1911	28	194 or about 85 per cent.			
1912	17	93	„	84½	„
1913	30	180	„	85½	„
1914	55	216	„	80	„

These results were clearly not the outcome of a higher death-rate among the singles after planting out, for in none of these years were the gaps in the ranks of the flowering plants at all numerous, and in two seasons every individual planted out was recorded. Nor, certainly, was it to be attributed to any method of *conscious* selection such as that practised by CHATÉ. The gardener who had raised the plants was as unable as myself to account for his success. The method pursued was the simple one of taking each year a sufficient number of the most forward and well-grown plants to fill the beds and discarding the rest. The strain was always kept going, the seeds harvested in any year supplying the plants for the next season but one. But it might be that a certain *unconscious* selection in favour of the doubles had been made at some point. If the single plants should prove to be slower growing to begin with and present a less robust appearance at

* Saunders, *Journal of Genetics*, loc. cit. See also *Comptes rendus*, loc. cit., and *Journal Roy. Hort. Soc.*, loc. cit.

the time of planting out than their sister doubles of the same sowing, then a choice of the more vigorous seedlings would naturally lead to a certain selection in favour of the doubles at the time of bedding out and might account for the unexpected results quoted above.

Experiments recently undertaken with the object of testing this view clearly point to the correctness of this latter explanation. In 1911 I was able to harvest seed myself from some of the few single individuals occurring that year in this strain (see number quoted above). Care was exercised to bring every seedling, if possible, to maturity, and none was discarded. *The results entirely preclude the idea that this particular strain is in any way exceptional as regards the output of doubles.* As has been set forth in earlier papers, the expectation for double-throwing strains is a *definite, though slight, excess* of doubles, the proportion being probably 9 doubles to 7 singles, or possibly only 8.5 doubles : 7.5 singles, *i.e.*, not quite 57 per cent. on the one view, rather more than 53 per cent. on the other. Now, whereas a proportion of only 30 singles to 180 doubles, or nearly 86 per cent. of doubles, were recorded in the College garden in 1913 (see above), I obtained in my culture of the same year from seed from the same source as many as 185 singles to 224 doubles, or about 55 per cent. of doubles, a result entirely in accord with the usual expectation. The evidence, in fact, points to this being a perfectly normal case, both as regards total output of doubles, and also as regards absence of localization at either end of the pods of the double-producing seeds. For in order to test this latter possibility (a view originally put forward by CHATÉ which, however, appears not to be borne out by the facts) a number of pods were halved across, and the seeds of the upper and lower ends sown separately; from both these sets the same slight excess of doubles was obtained as from the whole pods.* We may then conclude that the actual output of doubles in this particular strain is the same as that of all the other strains previously investigated, and amounts on the average to not more than 57 per cent. Where, then, an abnormally high proportion of doubles appears in the beds, we must suppose some selective action coming into play at a later stage than seed production. This selection, as will shortly be apparent, was exercised in this case, *though without intent to that end*, at the time of planting out, the very natural choice for the beds of the most vigorous young plants resulting in the *unintentional* saving of more doubles and fewer singles than would have been obtained from an equal number of the same batch of plants taken at random. That young double Stocks grow more vigorously than the singles I have long suspected, but opportunity for obtaining a considerable amount of evidence on this point was not found until this year. This difference in rapidity of growth is most easily seen if the young plants are raised in pots, a small number of seeds only being

* See also in this connexion "Further Experiments on the Inheritance of 'Doubleness' and other Characters in Stocks." Saunders, *Journal of Genetics*, vol. i. No. 4, p. 363, 1911.

sown in each pot, as far as possible at equal distances apart, and covered to an equal depth with fine sifted soil. The members of one pot-family are thus under conditions as nearly similar as possible, and can be allowed to grow undisturbed for a considerable time. In order to render the comparison as stringent as possible, only seedlings from the same pot were compared, these all being derived from the seed of one pod. When it becomes necessary to turn out the pots, the seedlings forming each pot-family can be sorted and labelled in order of their size. When the plants come into flower the following season the total number of doubles from the whole culture may approximate very closely to the expected 53 or 57 per cent., but if the plants belonging to each grade are tabulated separately the distribution of the doubles among the different grades shows a marked relation to degree of vigour. Among the most vigorous plants doubles were found to be greatly in excess of expectation; in each successive grade, as we descend the scale, the proportion of doubles steadily diminished, until among the least vigorous plants the singles were often found to be in the majority, the deficiency of doubles in these lower grades being approximately counterbalanced by the great preponderance occurring in the higher grades. If then, as in practice was found to be most convenient, the group containing the most vigorous individual from each pot-family is numbered 1, that containing the second largest individual from each family 2, and so on in order, we get a series in which, as a rule, the higher the number of the group, the smaller the proportion of doubles, and vice versa.*

Hence it appears that, when the vegetative period is sufficiently prolonged to render the method of selection by vigour practicable, this method may be successfully employed by the gardener, and will enable him to show in his beds a proportion of doubles far in excess of the natural output of the plant. Furthermore, I now feel little doubt that in this greater vigour of development of the doubles at an early stage we have the real explanation of the high percentages of doubles quoted by the French horticulturist CHATÉ,† and that the 70, 80 or 85 per cent. which he claims to result from reduction in the number of pods allowed to mature, and rejection of seed from the upper region of the pods, is, in fact, not due to these methods of *conscious* selection, but to an *unconscious* selection in favour of the doubles at the time of pricking or planting out.

* I hope to publish full statistical results on this point shortly.

† *loc. cit.*

THE USE OF CHARCOAL AS A MEDIUM FOR PLANT GROWTH.

By A. APPLEYARD, M.Sc., Rothamsted Experimental Station.

THE writer has recently had occasion to look up the references to the use of charcoal as a medium for plant growth, and it is thought that a short account of this subject may be interesting and lead to further work.

Many experiments with charcoal must have been made by gardeners during the nineteenth century which unfortunately have not been recorded in garden literature. In this way much valuable information has been lost. It is not until 1841 that we find many references to the use of charcoal by gardeners. At this time the editor of the *Gardeners' Chronicle*, speaking of its use, says: * "Very little is at present known about it in this country. It is said to be the means of making the most difficult kinds of plants strike root readily from cuttings. Gloxinias and plants of that description are made to flower freely, to remain a long time in flower, and at the same time the colours are rendered more deep and brilliant." A little later we read that Pansies which have been planted and struck in charcoal have a very vivid colour, and that *Combretum purpureum*, a plant not easily increased, is speedily rooted in charcoal. †

An apparatus ‡ for propagating plants, invented by Professor MARTIUS, of Munich, was described in the *Gardeners' Magazine* in June 1841. It consisted of a vessel packed with charcoal, in which the seeds were placed. A pit was dug, and a tank of water heated by a flue was fixed in it. The charcoal was then placed over the vessel containing water. Most astonishing results are said to have been obtained by this means, and indeed after a very short time we read that charcoal "has gained a reputation which nothing now can shake," and that the opinion of practical men is setting steadily in its favour.

During the 'forties charcoal was often used by gardeners, and the garden literature of this time contains many references to its use. It was found that orchidaceous plants grew well on charred wooden blocks. The practice had also at this time been introduced at Chatsworth, and further we read that nothing was more striking than its good effects in the garden of the Horticultural Society. In 1843 the importance of the use of charcoal as a manure threatened to revolutionize two-thirds of the practices then existing of gardening,

* *Gardeners' Chronicle*, 1841, p. 537.

† *Hovey's Magazine of Horticulture*.

‡ *Garten Zeitung*, 1841.

so far as the pot culture of plants was concerned. So great appears to have been the enthusiasm for charcoal about this time that we find one gardener writing: * "Charcoal is the most astonishing article to make use of for all purposes of cultivation, and especially for plants under artificial treatment." "Every plant under my care has some charcoal used about it." Fragments of charcoal left by the charcoal burners were spread on the land and said to be of great benefit. In certain districts they had already been in esteem as a manure for turnips and for "fining" grassland.† It was pointed out that the quality of charcoal is much improved by steeping it in liquid manure, and that the lighter and more spongy kind is better for the purposes of the cultivator.

Some gardeners soon began to doubt if charcoal possessed all the good qualities which others so enthusiastically claimed for it. Good results ‡ appear to have been obtained with such plants as oranges, *Ipomoea scabra*, *Gesnera*, and Cacti; but little success § seems to have attended its use in cultivating various other kinds of plants. The varying results which were obtained gave rise to a controversy about the beneficial effects of charcoal on plant growth, which lasted for a considerable time.

Writing to this Journal in 1847, Cameron says he found charcoal serviceable in the culture of native orchids, because "it keeps the soil open and porous, and thereby prevents sourness and clamminess after heavy rains in winter." Several theories of the action of charcoal, alone and mixed with soil, on plant growth were put forward. It had been pointed out by LIEBIG that charcoal absorbs carbon dioxide and ammonia, and it was thought that these dissolved in water and were thus assimilated by the plant. It was known that the addition of charcoal to a soil containing animal manure reduced, if it did not prevent, loss of ammonia. Charcoal was thought to have a mechanical as well as a chemical effect. Some maintained that charcoal itself was a plant food, and we read || that "until some experimental evidence is produced to prove that plants cannot feed on charcoal we shall believe that they can."

In 1849 a licence to make peat charcoal was granted to the "Irish Amelioration Society," and the following year this substance sold in London at 70s. a ton. The high prices which were demanded for charred peat gave rise to many complaints amongst gardeners and farmers.

About 1851 Mr. JAMES CUTHILL, of Camberwell, writes: "I consider charred peat in a melon ground to be as necessary as a telegraph to a railroad. . . . The one is incomplete without the other." Evidence ¶

* *Gardeners Chronicle*, 1843, p. 907.

† *Rural Economy of the Midland Counties* (Marshall), and *Journal Roy. Agr. Society of England*, 1844, p. 507, and 1846, p. 539.

‡ *Proceedings of the Horticultural Society*, 1843, p. 17.

§ *Gardeners' Chronicle*, 1845, p. 188.

|| *Gardeners' Chronicle*, 1843, p. 875.

¶ *Gardeners' Chronicle*, 1851, p. 751.

is brought forward a little later to prove that from time immemorial peat charcoal had been acknowledged to possess valuable fertilizing qualities, and that inventors and discoverers in those piping times had only discovered "a lost sheep in the wilderness."

Charcoal does not appear to have progressed in market value during the 'fifties as it would have done had its application been successful.

In a lecture to the Society of Arts in 1855 Mr. LONGMAID said: "It is useful to apply by drill or broadcast 4-7 cwts. to the acre to all green crops. It will also be found valuable on clayey soils."

About 1881 it appears to have been used on wheat land to prevent rust, and it is recommended to gardeners for *Auricula* soils.

In 1891 W. THOMSON, writing to this Journal on soils and manures for grapes, says: "Charcoal is an excellent addition to soil where clay is in excess." Indeed at this time it was frequently used for making up vine borders. Interest in the use of charcoal has recently been revived in a paper* by M. D. PRIANICHNIKOW, of the Agricultural Institute of Petrovskoë (near Moscow). After discussing the theory of WHITNEY and CAMERON in the light of the Rothamsted experiments on continuous wheat-growing, he goes on to describe his own experiments with Russian soils (black earth) which are supposed to be infertile on account of the toxins which they contain. He extracted these "sick" soils with water and after filtering the extract through charcoal he found that he got a greatly increased growth over that produced in the extract which had not been filtered through charcoal. He grew oats, wheat, buckwheat, maize, and other crops in these soils to which he added charcoal. Better crops were obtained from the soils treated in this way than from the untreated, and he concludes that charcoal renders the supposed toxic excretions inert.

When he grew the same kind of plant in the same soil year after year he found the crop rapidly diminished. On adding charcoal to the soil, however, the crop was well maintained.

He ends his paper by saying: "Nous estimons que l'action utile du charbon dans les cultures répétées doit être étudiée pour qu'on puisse constater définitivement si l'action utile du charbon est en relation avec l'existence des excréments nuisibles des racines, ou si les causes de ce phénomène sont d'un autre ordre."

If toxins are excreted by the roots of plants it is possible that the charcoal has in some way rendered them inert, but up to the present time it has not been satisfactorily shown that such substances are in fact produced.

* *Revue Générale de Botanique*, tome 25 bis, 1914.

THE POSSIBLE SOURCE OF ORIGIN OF THE LEAF-SPOT DISEASE OF CULTIVATED CELERY.

By GEO. H. PETHYBRIDGE, B.Sc., Ph.D., F.R.H.S.

THE presence of the leaf-spot disease of celery, caused by the parasitic fungus *Septoria Petroselinii* var. *Apii*, was first announced in England * and in Ireland † in the autumn of 1906, although on the Continent and in the United States of America the disease has been known for more than twenty years.

There is no doubt that during recent years it has become widely spread in the British Isles, and that where no preventive means are taken serious losses occur. Leaflets dealing with the disease have been published both by the Department of Agriculture and Technical Instruction for Ireland (No. 5) and by the Board of Agriculture and Fisheries in England (No. 238). An excellent illustrated account of the disease, with very full references to the earlier literature, was published in a previous volume of this JOURNAL, ‡ and more recently another one has appeared in the *Gardeners' Chronicle*.§

As to the means by which the disease has become spread through the country, there can be but little doubt that this has occurred mainly through the employment for sowing purposes of celery "seed" bearing the spore-containing fructifications (*pycnidia*) of the fungus partially embedded in the pericarp.

KLEBAHN,|| apparently, was the first to call attention to the possibility of the spread of this disease by means of affected "seed," although he did not actually prove that such affected "seed" gave rise to diseased seedlings. Recently, however, it has been fully established both by CHITTENDEN ¶ and by the present author ** that celery "seed" bearing the fructifications and spores of the parasite (and such affected "seed" is abundant in commerce) may and does produce diseased seedlings. Further, it has been shown that by steeping such "seed" in appropriate germicides such as hydrogen peroxide or dilute formaldehyde, the disease-producing parasite upon

* *Gard. Chron.* xl. 1906, p. 378, and *Journal R.H.S.* xxxii. 1907, p. xciii.

† *Irish Naturalist*, xv. 1906, p. 271.

‡ CHITTENDEN, F. J., "Leaf-spot of Celery," *Journ. R.H.S.* xxxvii. 1911, p. 115.

§ SALMON, E. S., "Celery 'Blight' or 'Rust' (*Septoria Petroselinii* var. *Apii*) and its Prevention," *Gard. Chron.* liii. 1913, p. 414, and liv. 1913, p. 3.

|| KLEBAHN, H., "Krankheiten des Selleries," *Zeitschr. f. Pflanzenkrankh.* xx. 1910, p. 1.

¶ CHITTENDEN, F. J., "A Note on Celery Leaf-spot Disease," *Ann. of Applied Biol.* i. 1914, p. 204.

** PETHYBRIDGE, G. H., "The Spread of the Celery Leaf-spot Disease by the Use of Affected Seed, and its Prevention," *Journ. Dep. of Agric. and Tech. Inst. for Ireland*, xiv. 1914, p. 687.

it can be killed without adversely influencing the vitality of the "seed" itself.

The spread of the disease from place to place is thus satisfactorily accounted for, and means for preventing this have been discovered, but it may not be superfluous to point out that when once the disease has obtained a foothold in a garden or field its reappearance in subsequent seasons may occur even if unaffected or disinfected seed be used. The fructifications containing the spores of the fungus are produced often in enormous abundance on the diseased foliage of celery plants, and can exist uninjured on the decayed remains of such foliage over winter. Unless such decayed remains are promptly destroyed by burning, they constitute a source from which the disease may arise in the following season.

To combat this disease, therefore, three modes of attack must be employed.

1. All celery seeds should be examined by a competent mycologist, and if necessary they should be treated with an appropriate germicide. The onus of providing disease-free seed should, of course, not be placed on the gardener. He should thrust it on the seed merchant and he in turn upon the seed-grower.

2. If the disease appears it should be kept in check by spraying the plants with Bordeaux mixture, in a somewhat similar manner to that adopted for checking potato blight.

3. All diseased portions of the plants should be most carefully collected and burned, and in no circumstances should they be allowed to remain in or on the soil, or to reach the manure or compost heap.

There is, however, a further possible source of infection, namely by transference from plants other than cultivated celery. The same fungus, it seems, is found, though in the British Isles apparently only rarely, on parsley. It is not unlikely, although definite proof by means of infection experiments has, so far as I am aware, not yet been brought forward, that the celery leaf-spot disease may be contracted from affected parsley.

If the same fungus occurs on parsley it is not unreasonable to suppose that it may be found on other plants belonging to the family Umbelliferae, and in particular on wild celery. In this connexion the following passages, quoted from Mr. CHITTENDEN'S paper in this JOURNAL already alluded to, are of interest. Dealing with the distribution of the fungus on celery, he says: "A curious and possibly significant fact is that there are apparently no records whatever of the fungus attacking wild plants. The celery occurs wild in marshes over a large area in Europe, North Africa, Western Asia, and North-West India, but the disease seems to have been spread with cultivated celery and not from the wild plants to cultivated ones, as so many fungi have done."

Further on he says: "As already pointed out, there are no records of the occurrence of the fungus on wild celery. It must, however, be

confessed that our knowledge of the occurrence and distribution of these minute fungi upon wild plants is very incomplete. It would be a useful and interesting piece of work for anyone with the requisite technical knowledge and leisure to ascertain precisely to what extent the fungi which attack our cultivated plants will infect their wild allies, and vice versa. Microscopical examination alone is unfortunately not to be relied upon, and may actually be misleading, for we have to reckon with two very curious phenomena in the physiology of fungi—polymorphism, and the perhaps even more strange case where morphologically similar fungi are restricted in their range of infective capacity, and cannot indiscriminately attack any variety even of one species. Only carefully conducted and controlled cultural and infection experiments are likely to give reliable evidence.”

Although the variety *Aprii* of the fungus has not been recorded on wild plants, there is a record of a species, *Septoria Petrosellini* forma *segetum* P. Brun, occurring on the leaves of *Petroselinum segetum* in France. The spores of this form are $30-50 \times 1 \mu$. It would be interesting to see what would be the result of trying to infect cultivated celery with this fungus.

In the summer of 1913, while cycling along the coast road of Ballyconneely Bay, a very remote spot in West Galway, I noticed a considerable clump of what appeared to be wild celery in full flower. Being in the company of a fellow botanist, we called a halt to examine the plants, in order to ascertain that they really were celery plants, for although the district was fairly well known to me I had never seen the wild celery in it previously. The plants certainly were what we at first guessed them to be, and evidently the colony was an old-established one.

On looking up the distribution of this plant in Ireland as given in PRAEGER'S "Irish Topographical Botany," it was found that, although it occurs locally round almost the whole coast of Ireland, its presence had not been recorded for the division West Galway. Hence its discovery there links up the distribution of the plant in the South-East Galway division with that in the West Mayo division.

On examining the plants it was noticed that the foliage was considerably spotted with rounded, dead areas, on some of which were a few minute black bodies suggesting pycnidia. The opinion was hazarded, more perhaps as a jest than anything else, that here was the cultivated celery disease on the wild celery!

Certainly the macroscopic appearances were rather against the suggestion. The spots on the leaves were seldom, if ever, confluent; they were relatively small, and they retained their form and individuality even on old leaves which were apparently otherwise dying a natural death. There was no appearance of a general decay of the leaves caused by the presence of the fungus, such as occurs in the case of the cultivated celery: and furthermore the numbers of pycnidia on the diseased areas were very small, generally only one or two, and frequently none at all.

Microscopical examination in the laboratory of the material which was collected showed, however, that the fungus certainly was a *Septoria*, and the appearance presented by the spores suggested strongly that it was none other than *Septoria Petroselini* var. *Apii*, hence it was recorded as such.* It is true that the spores, when measured, were found to be rather larger than is usually the case when the fungus grows on cultivated celery, but too much stress must not, I think, be laid upon variations in the sizes of spores in such cases. I have found considerable variation in size, particularly as regards length, in the spores of this fungus on cultivated celery.

According to KLEBAHN, the spores in Briosi's type material are from $22\ \mu$ to $42\ \mu$ long. SACCARDO says they are similar to those in *Septoria Petroselini*, i.e. from $35\ \mu$ to $40\ \mu$. CHITTENDEN gives them as being from $38\ \mu$ to $42\ \mu$, and in one instance I found them from $36\ \mu$ to $49\ \mu$ in length. The spores of the fungus found on the wild celery varied from $27\ \mu$ to $49\ \mu$ in length, and from $2.1\ \mu$ to $2.4\ \mu$ in breadth.

No favourable opportunity occurred in 1913 for carrying out infection experiments from the wild to cultivated plants, but during the past summer the locality was revisited and fresh material collected.

Infection experiments, with the necessary controls, were carried out, both at the Temporary Station for the Investigation of Plant Diseases established by the Irish Department of Agriculture at Clifden, Co. Galway, and in the Department's Seeds and Plant Diseases Division in Dublin. At Clifden the plants of cultivated celery were in pots sunk in the ground in the open air, while in Dublin the experiments were made in a greenhouse. Some of the plants were kept covered with bell jars and some were not.

Where water containing spores of the fungus from the wild celery was applied to the foliage of healthy cultivated celery plants, infection occurred, but no sign of the fungus appeared on the control plants. Moreover, the effect of the fungus on the cultivated plants was very different from that seen in nature on the wild plants. The attack was much more severe, and in fact resembled in every way the appearance of the now, unfortunately, too well-known leaf-spot disease on cultivated celery. The spots became enlarged in area and confluent, pycnidia appeared in abundance, and the foliage underwent decay, apparently as a direct result of the attacks of the fungus.

The spores produced by the fungus when transferred from wild to cultivated celery appeared to be somewhat reduced in size. They measured in the latter case $20-43 \times 1.8-2.4\ \mu$, the average being $32.4 \times 2.1\ \mu$.

It was not possible to carry out the reverse infection, viz. from the cultivated plant to the wild one, because it was impossible to obtain wild plants on the foliage of which the fungus was not already present.

These infection experiments lead me to conclude that the fungus

* *Irish Naturalist*, xxiii. 1914, p. 48.

found on the wild celery is identical with that which causes the well-known leaf-spot disease of the cultivated celery, and that the original source of the disease is to be looked for in the parasite occurring on the wild plant. That its effect on the cultivated plant is much more serious than on the wild plant is explainable upon the assumption that through continued cultivation the stamina of the host plant and its power of resisting the attacks of parasites has become weakened.

I think it likely that if a thorough search were made for it the fungus would be found on wild celery in other countries, and no doubt it was in one or more of them that the original transference of the fungus from the wild to the cultivated plant took place, and possibly is still taking place.

There is, of course, the bare possibility that the wild celery plants in West Galway may have become infected from cultivated plants, but this, I think, is highly improbable. The colony of plants in question is situated in a damp spot near a tiny inlet of the sea, in a very remote and extremely backward part of the country, and although there are a few peasants' cottages scattered through the district, celery is an unknown vegetable there. For this reason also, and because, as far as I am aware, celery is not grown for seed anywhere in Ireland, I do not think that this country can be looked upon either as the source from which the disease came, or as a centre from which it has been disseminated.



FIG. 101 IRIS LEAVES, SHOWING THE BLIGHT DISEASE IN VARIOUS STAGES.

To face p. 480



FIG. 102. IRIS LEAVES, SHOWING THE BLOTCH DISEASE IN VARIOUS STAGES.



FIG. 103. FUNGUS ISOLATED FROM TEAL, GROWING ON TEAL ME JUICE AGAR
(natural size)



FIG 104 —CULTURE AS ON FIG 103, SHOWING UNDER SIDE OF GROWTH



A

B

FIG. 105.—CULTURE OF *HETEROSPORIUM GRACILE* ON GLUCOSE AGAR.
A, *natural size*; B, *magnified*.



FIG 106.—*HETEROSPORIUM GRACILE* FROM IRIS LEAF

A, conidia from diseased leaf, B, conidia from a pure culture showing unequal distribution of warts on young spores, C, D, spores germinating in water, E, I, spores germinating in prune-juice agar; G, thick-walled mycelium sending out hyphae in water, H, J, hyphae showing remains of articulations; K, L, formation and development of conidia; M, mature spore germinating *in situ*, N, thick-walled parallel hyphae.

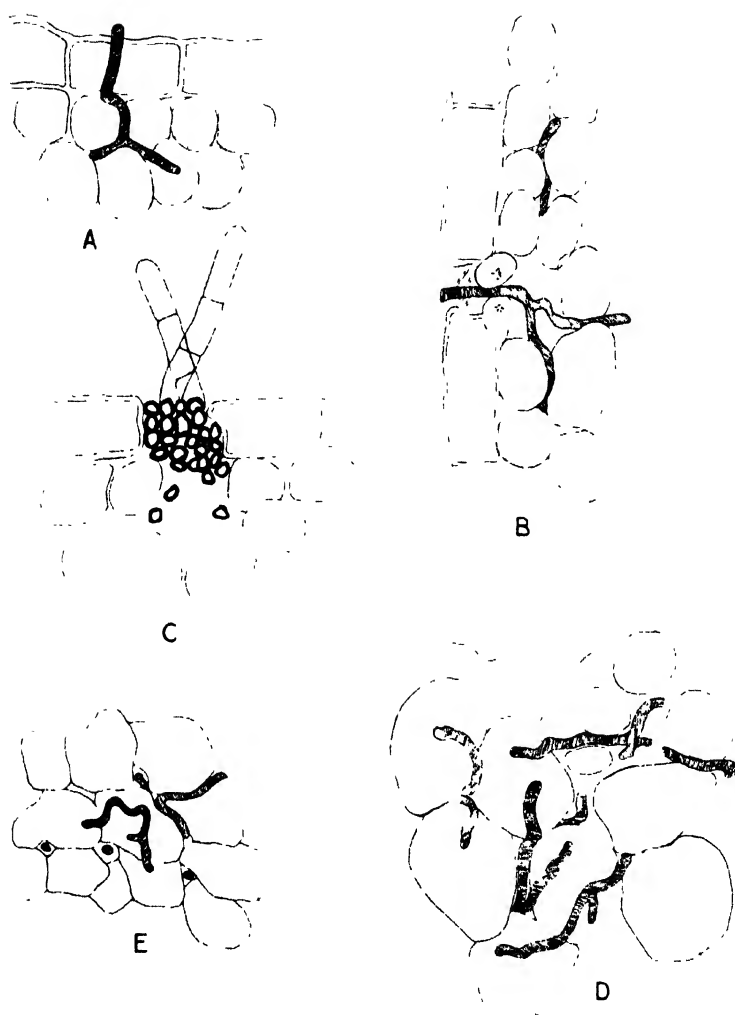


FIG. 107. -*HELIOTROSPORIUM GRACILE* INFECTING IRIS LEAVES

A, showing the infection thread piercing the epidermis. B, showing infection thread penetrating by way of stoma. C, conidiophores arising from thick-walled pseudoparenchymatous tissue and passing through open stoma. D, mycelium ramifying in tissues and penetrating cells. E, section parallel to surface showing both inter- and intracellular mycelium.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXIV.—IRIS LEAF-BLOTCH DISEASE (*Heterosporium gracile* Sacc.).

By J. K. RAMSBOTTOM, R.H.S. Scholarship Student.

FOR several years past the tall bearded section of the genus *Iris* has suffered from the disease known as Leaf-blotch (*Heterosporium gracile*). The disease was first recorded in this country on the living leaves of *Iris germanica* by Dr. M. C. COOKE in 1893. Since then it has become very troublesome and has excited inquiry among cultivators. With us the disease is noticed particularly in the late summer and early autumn, during August and September, but it is often present on the leaves in the spring. The attack in its earliest stages assumes the form of very small discoloured spots, no bigger than pin-heads, which later increase in size and become brown, with a rounded outline. As growth continues the margins of the spots become more irregular, and usually two or more spots become confluent, until finally the greater part of the leaf is covered with irregular yellowish-brown blotches, bounded by a darker brownish margin (figs. 101, 102). At the same time the leaves appear sickly, and later on lose their elasticity and become shrivelled. The rhizomes are rarely killed, and in the next year new growths from lateral buds make their appearance; the plants, however, are injured very greatly by the disease. They may flower for a few years, but eventually become weak and die.

On examining one of the diseased leaves with a hand lens a number of very small black dots will be noticed on the diseased areas. Microscopic examination reveals that these black dots consist of tufts of 3–5—septate fungus threads, 150–200 μ in length, which push forth one or many through the stomata of the leaf, bearing the spores singly at their apices. These conidia are attached very loosely and are readily dispersed by the wind. On the spots that are produced early in the spring there is no evidence of the fruiting hyphæ, but there is plentiful mycelium, which can be easily made out in hand-cut sections stained with an alkaline solution of azol blue.

Not only is the disease known all over Europe but it has been recorded from Asia (Lydia), Africa (the Cape), America (U.S.A.), and Australasia (New Zealand). The species recorded in the most recent work on Hyphomycetes* as affected in Europe are *Iris bohémica*, *I. florentina*, *I. germanica*, *I. Gueldenstaediana*, *I. pallida*, *I. Pseudacorus*, *I. spuria*,†

* G. LINDAU in Rabenhorst, *Krypt. Fl.* 2nd Edit., *Pilze* I. ix: (1907), p. 79.

† Mr. W. R. DYKES, in a letter to me, queries what plant is intended by this name.

and species of *Narcissus* and *Gladiolus*. ERIKSSON * gives as an additional host *I. atomaria*, and LIND † mentions among other species *I. propendens* ‡ and *I. plicata*.§ *Chlorogalum angustifolium*,|| *Hemerocallis fulva*,¶ *Gemmingia chinensis*, *Iris Swertii*, *I. benacensis*, and *I. orientalis* ** are recorded as hosts in America.†† Many exsiccatae have merely the generic name of the host plant.

History and Nomenclature.—The species of *Heterosporium* causing the disease under consideration is most commonly referred to as *Heterosporium gracile* (Wallr.?) Sacc., although very frequently the query is omitted. In considering the history of the fungus it was apparent that the specific name would have to be rejected if it were attributable to WALLROTH. There is a great objection to altering such a well-known name, and our reasons for retaining it are given below. Several points with regard to the genus *Heterosporium* which appear of sufficient interest are also noted.

The description of WALLROTH's fungus occurs in his "Flora Cryptogamen," ii. (1833), p. 164, under the genus *Helmisporium* ("Helmisporium, Lk. obs. *Helminthosporium* Pers. myc. et Lk. sp. *Coelosporium* Lk."), and is as follows, "*Helmisporium gracile* W., rhabdis simplicibus nodosis gracilescentibus erectus pelliculis fasciculatis, appendicibus sporomorphis circa apicem congestis ovatis minimis 3-4 septatis utrinque obtusiusculis, rhabdorum molem subaequantibus—*Helmisporium gramineum* W. olim. Ad folia vaginasque graminum cerealium sicca et Iridum folia passim." There are in this description several points which suggest the Iris disease, but perhaps the fact that the diagnosis refers to a black mould which occurs on Iris leaves has led to the idea that it was identical with the fungus we are considering. But it does not seem that "appendicibus sporomorphis circa apicem congestis ovatis minimis 3-4 septatis" can possibly refer to a fungus spore of $30-80 \mu \times 15-20 \mu$ (i.e. visible to the naked eye) generally biseptate and borne singly at the tips of the conidiophores. The fungus is much more frequently referred to the genus *Brachysporium* and becomes *Brachysporium gracile* (Wallr.) Sacc.‡‡ It is clear that both these specific names cannot be based on the original description. It would seem that the description applies much better to the *Brachysporium* than it does to the *Heterosporium* in every way. LINDAU refers to the spores of *Brachysporium gracile* thus:—"Konidien am Scheitel des Trägers

* *Fung. parasitica scandia*, No. 398.

† *Danish Fungi as represented in the Herbarium of E. Rostrup.*

‡ Mr. W. R. DYKES, in a letter to me, queries what plant is intended by this name.

§ DE THÜMEN, *Mycoth. Univ.* No. 876, records *Helminthosporium gracile* on leaves of *I. biglumis*.

|| *Flora of Sequoia gigantea Region*, No. 2033.

¶ ELLIS ET EVERHARDT, *North Amer. Fungi*, 2nd Series, No. 2189.

** E. BARTHOLOMEW, *Fungi Columbiani*, Nos. 1828, 2627, 2731, and 2732 respectively.

†† The published sets were consulted in the Botanical Department of the British Museum.

‡‡ E.g. Sacc. *Syll. Fung.* iv. (1886), p. 430, where there is a note added, "cfr. *Heterosporium gracile*," which is given *tom. cit.* p. 480 as *Heterosporium gracile* (Wallr.?) Sacc.

gedrängt stehend, eiförmig, beidendig stumpflich, mit 3-4 Scheidenwänden, sehr klein," and the habitat as on leaves and sheaths of cereals, and on the leaves of *Iris* and *Gladiolus* species. It seems evident that if WALLROTH refers to a single fungus it is the *Brachysporium*. There is no record of *Heterosporium gracile* on Gramineae, whereas *Brachysporium gracile* is recorded both on this family and on *Iris*, &c. That it was a species principally affecting grasses is apparent from the fact that WALLROTH first mentions grasses so particularly and had previously called the species *Helmisporium gramineum*. (I have unfortunately been unable to trace the description of this.) It seems apparent that the *Iris* disease under consideration is not included in WALLROTH's description. The point is important, since as both fungi cannot take their specific name from the one description the name would have to be taken for the first species split off.* If the species is not included in WALLROTH's description, what specific name must be applied to it?

The genus *Heterosporium* is small, and consists of a group of species separated off from *Helminthosporium*, from which it differs in the punctate wall of the spores, &c. The name *Heterosporium* first occurs in KLOTZSCH, *Herbarium Vivum Mycologicum*, 1832. In this published set No. 67 has a written label "*Heterosporium maculatum* Kl. MSS. (novum genus Hyphomycetum). In caulibus putrescentibus," and No. 69, similarly "*Heterosporium Ornithogali* Kl. MSS. (novum &c.). In foliis Ornithogali umbellati." There is no description either generic or specific. M. C. COOKE, in a paper on black moulds read before the Quekett Club,† called attention to these specimens of "KLOTSCH," and pointed out that though the fungus called *Heterosporium maculatum* was probably a species of *Cladosporium*, that labelled *Heterosporium Ornithogali* was the type of a distinct genus. This idea he elaborates in an article in "*Grevillea*" v. (1877), p. 122. Here he diagnoses the genus and includes therein certain species previously placed in the genus *Helminthosporium*. One of these species was *Helminthosporium echinulatum* B. et Br., which was recorded by them as attacking Carnations (*Gard. Chron.* 1870, p. 352). BERKELEY and BROOME afterwards described the same fungus as attacking Sweet Williams,‡ but renamed it *Helminthosporium exasperatum*. Afterwards SACCARDO and ROUMEGUÈRE § again renamed it *Heterosporium Dianthi*. SACCARDO later found the *Heterosporium* sp. which causes the *Iris* disease and gave it the name *Heterosporium echinulatum* (B. et Br.) Cooke, with a revised description,|| and published a figure of it with this name in "*Fungi Italici*," tab. 804. This is apparently the first reference to this fungus in literature, though DE THÜMEN has three specimens

* The name *Helmisporium gramineum* appears to be a manuscript name, and if so the specific name cannot be taken up, but it does not affect the case under consideration.

† *Journ. Quek. Micros. Club*, v. (1877), p. 246.

‡ *Ann. Nat. Hist.* 1873, "Notices of Brit. Fungi," No. 1380.

§ *Rev. Myc.* iii. (1881), p. 57.

|| *Michelia*, ii. (1881), p. 364.

in his *exsiccatae* labelled *Helminthosporium gracile* and referring the species to WALLROTH.* It would be most illogical to accept DE THÜMEN'S name, as there is no description, and, further, the plant distributed is clearly different from WALLROTH'S diagnosis. It is obvious that the name *Heterosporium echinulatum* cannot be used for the species, as it has been previously used for another fungus, as shown above.

SACCARDO himself realized his misdetermination, and in his "Sylloge" (iv. p. 480) refers the species to that of WALLROTH as DE THÜMEN had previously done. The descriptions clearly show, as pointed out above, that WALLROTH'S plant is entirely different and is the modern *Brachysporium gracile*. The specific name *gracile*, therefore, as applied to *Heterosporium*, having really no connexion with WALLROTH'S description, can be used for the fungus diagnosed by SACCARDO.

Thus the synonymy for the species is *Heterosporium gracile* Sacc. Syll. iv. (1886), p. 480 = *Heterosporium echinulatum* Sacc. Mich. ii. p. 364, non (B. et Br.) Cooke et auct.

Description of Spores.—The mature spores vary in length and breadth. They measure from 30–80 μ in length and 15–20 μ in diameter, are oblong-cylindrical, with rounded ends, and are slightly constricted at the septa. The average spore has two septa, but continuous, uniseptate, triseptate, and even occasionally quadrisepate spores occur (fig. 106). The epispore is studded with small projecting warts. The conidia are at first colourless, but gradually assume a pale olive colour, and finally become brownish-olive. The warts are developed while the conidia are in a young state, and septa appear to be formed after the conidia have reached their full size (fig. 106, B).

Germination of Spores.—The germination of the spores was observed in spores taken from Iris leaves and placed in watch-glasses, and also in hanging drop cultures in various media, the spores in the latter case being obtained from pure cultures. The spores were taken from the cultures by means of a platinum needle, previously sterilized by heating, and dispersed in a drop of sterile water upon a sterilized glass slip. By repeating the operation a few times enough spores were present to ensure one to four being transferred by one dip of the needle to the hanging drop. The media used were sterilized water, 2½ per cent. cane-sugar solution, prune juice, glucose agar, and prune-juice agar. The germination was similar in all the media. Spores sown at 9.30 A.M. pushed out germ tubes by 2 P.M. of the same day. Sometimes the germ tube arose from the end cell and at other times from the middle. The next afternoon, *i.e.* after about thirty hours, practically every cell had produced a germ tube, and it will be seen from the illustrations that a two-celled spore was capable of producing three, and a three-celled spore as many as five germ tubes (fig. 106, C–F). The hyphæ had grown greatly in length and had a characteristic waviness. It was also noticed that in several instances the hyphæ had become branched and septate after attaining a length of 200 μ on solid media and 250–300 μ in liquid media.

* *Mycoth. Univ.*, Nos. 666 and 876: *Fung. Austr.*, No. 1066.

After three days' growth, the small colony consisted of a mass of intermingled hyphæ which originated from the branching of the main germ hyphæ of the spore. The hanging drops were examined every few hours to discover when spores were first produced. On the morning of the fifth day a few spores were noticed which apparently had been formed during the night. The conidia were not produced in chains of two or three spores, as had been observed by Dowson * in the case of *Heterosporium Betae*, but were formed singly at the tip of the conidiophore, as the same author says is frequently the case with *Heterosporium echinulatum* (fig. 106, L). After the formation of the conidium, the conidiophore continues in growth and produces at its tip another spore, the original spore being pushed to one side. This is repeated several times (fig. 106, K). It was also observed that the spores were capable of germination *in situ* (fig. 106, M).

Cultures of the Fungus.—On account of the rapid germination of the spores it was not a very difficult matter to isolate the fungus and to establish pure cultures, but it must be stated that growth on all media was slow. The fungus was first grown on beef-extract gelatine, in which it formed a dense sunken mycelium and whitish aerial hyphæ, but owing to the fungus causing liquefaction of the gelatine at this stage it was necessary to cultivate on an agar medium. The mycelium produced spores when grown on the gelatine medium. When using prune-juice agar and glucose agar the mycelium grew a little more vigorously on the former medium.

The sunken hyphæ were brownish black in colour and the aerial hyphæ were light grey tinged brown, the latter colour being due to the spores, which could be distinctly made out by means of a hand lens of ten diameters magnification. Abundant aerial mycelium was produced on the different media, and the colony formed in every case became dome-shaped, but never extended over the whole available area of the medium. Figs. 103, 104, represent a five-weeks-old culture.

In slants of glucose agar in test-tubes the fungus also formed dome-shaped colonies. The sunken hyphæ grew rapidly, but aerial hyphæ and spores were not so freely produced (fig. 105).

Infection Experiments.—The varieties of bearded Iris, "The Bride" and "Albert Victor," which had been known to suffer from the disease, were removed from the Iris beds in February and planted immediately in two distinct rows on ground adjoining the laboratory. It was thought inadvisable to pot the plants and conduct the inoculation experiments under glass, for the reason that this section of Iris is rather unsuitable for pot culture. The spores were obtained from Petri-dish cultures of prune-juice agar by means of a sterilized needle and dispersed in water, a few drops of which, on examination under the microscope, were found to contain a good number of spores as well as short pieces of hyphæ. At the beginning of March five of the clumps had separate cloches placed over them, three being used for infection, the other two acting as controls.

* *Mycol. Centralblatt*, ii. (1913), p. 1.

Inoculation.—It was found that a drop of water could not remain on the leaf because of the waxy epidermis. The wax was therefore removed by means of a dry cloth. The leaves so treated were marked in such a manner that the inoculated area could be easily recognized. The soil was removed at a little distance around the plant, so as to leave a depression into which water could be poured without removing the cloches, and by this means the atmosphere around the plants was kept constantly in a state of humidity. The conditions were precisely the same for the plants acting as controls. The plants were under daily observation, and twenty-nine days after inoculation small discoloured spots were observed on the leaves in the inoculated areas. Some of the spots were cut out, and hand sections made which showed an abundance of mycelium; other pieces were imbedded in wax in the usual way. No spores of the fungus were seen. The spots increased in size, and a period of six weeks elapsed between inoculation and production of spores from the infecting mycelium. The spores proved to be those of *Heterosporium gracile*. The control plants remained perfectly healthy, and showed no signs of disease or discolouration. The experiment was repeated, and different clumps of plants were used. The weather at this time was warm and sunny, and in this case the conidia were produced after a period of four weeks, the shorter period being due to the high temperature and dampness of the atmosphere within the cloches—conditions favourable to the growth of the fungus.

Examination of Diseased Tissue.—The material for examination was taken from diseased Iris leaves growing in the gardens, and also from the artificially infected plants. Killing and fixing reagents used were Flemming's medium solution, chromacetic acid, and acetic alcohol. The material was cleared in xylol and imbedded in wax with a melting point of 54°C. Microtome sections were cut 5–15 μ thick. Material killed with Flemming's solution and stained with safranin—gentian violet—orange G, gave the best results, although iron hæmatoxylin with a counter stain of eosin was found excellent. Observations were also carried out with hand sections and macerations of fresh material. It was a rather difficult matter to arrive at the true nature of the mycelium within the tissues of the leaves, and old diseased areas were found most unsatisfactory for cutting. The mycelium was multiseptate and was present in large quantities in the intercellular spaces (fig. 107). No haustoria were found, and in material which had been cut through the centre of a diseased spot hyphæ were observed penetrating the cells of the tissue, in which cases the cell walls and protoplasm became brown and partially consumed (fig. 107). In the air space adjacent to the stomal opening, the hyphæ formed clumps of a pseudoparenchymatous nature, and it was from these that the conidiophores were given off through the open stomata to the exterior (fig. 107, c).

In a few instances thick-walled, closely septate hyphæ were seen in the macerated material which had been taken from naturally

diseased plants in February (fig. 106, N). These were placed in water at the bottom of a watch-glass, and the cells were capable of sending out hyphæ, although no conidia were observed under these conditions (fig. 106, G). This type of growth is, of course, common in all groups of fungi.

Penetration of the Fungus.—The method of penetration of the germ tube of the fungus was definitely determined by careful infection experiments. Pieces of healthy leaves were painted over with water in which germinating spores were suspended, and placed in a Petri dish on sterilized blotting-paper. After four days pieces of the leaves were cut and imbedded in the usual way. Microtome sections cut at a thickness of 5 μ showed the germ tubes boring through the epidermis (fig. 107, A), and spreading themselves between the cells of the tissue immediately underneath. The germ tubes were also observed penetrating the leaf by way of the stomata (fig. 107, B). Under these conditions of infection, spores were produced a little under three weeks from the day of inoculation.

Other Experiments.—The fungus *Heterosporium gracile* has been recorded on *Narcissus*, *Gladiolus*, and other monocotyledons. J. RITZEMA Bos, in describing *Narcissus* attacked by *Heterosporium*, remarks upon the extraordinary rapidity with which the disease spreads. He regards the fungus as a true parasite, but it can also live saprophytically in the leaves which it has itself killed, and it is here, on the dead leaves, that it forms spores. This leads him to hold that the fungus was first of saprophytic nature. In years when the disease is not prevalent it occurs on wounded overground portions of the plants. The Dutch bulb-growers maintain that the withdrawal of the dead shrunk remainder of the faded flowers is an excellent means of preventing the disease, but the parts must be removed without injuring the still living flower stalk. His examination of the faded flower parts showed the presence of *Heterosporium* spores even before the fungus had appeared on the living leaves.

It seemed desirable to endeavour to find whether the fungus from diseased *Iris* would infect *Narcissi*. *Narcissus* plants were lifted from the open ground in February and potted directly with much soil attached. The plants suffered in no way from their removal, and were kept in the greenhouse attached to the laboratory. At a later date the plants were inoculated at the same time as the infection experiments with the *Irises*, and spores were taken from the same cultures. Each pot was placed on a flower-pot dish with a little water and then covered with a bell glass. Other plants were kept as controls. The plants were under daily observation, but no spots such as those which appeared on the *Iris* leaves were seen. The leaves completed their growth, turned brown at the tips, and withered away in a perfectly natural manner. Between ten and eleven weeks after inoculation, black felt-like growths were seen on the inoculated leaves, and were thought to be those of some saprophytic mould, but on microscopic examination the spores and hyphæ of *Heterosporium gracile* were found to be present in abundance.

The control plants behaved in exactly the same way, with regard to their length of growth and withering of the leaves, but in no instance were the spores of *Heterosporium gracile* found.

Infection experiments were also performed with leaves placed in Petri dishes in the manner described above, in the case of Iris, and in these experiments spores were formed only after the leaf was dead. The method of inoculation was repeated a number of times with the same results.

Close observations were carried out with regard to the Narcissus plants in the gardens, of which there is a large and representative collection, but in no instance was a plant found with *Heterosporium gracile* growing upon it, either on the living or on the dead foliage. Mr. CHITTENDEN also searched his garden, where some Irises are attacked by *Heterosporium gracile*, but he was unable to find a Narcissus plant affected.

Experiments were conducted for the purpose of infecting Gladiolus and Hemerocallis leaves, but without success, the leaves becoming covered with saprophytic moulds before the *Heterosporium* had completed its life cycle.

Vitality of the Spores.—The time during which spores would retain their vitality was considered with a view to ascertain if these were the means of starting the outbreak the following year. No difficulty was experienced in collecting spores from diseased leaves from October until the end of January, and these were germinated in watch-glasses or hanging drops, according to the number of spores that were found. Sharp frosts were recorded at Wisley in January, and on the 23rd of this month the temperature on the grass was 8°F. On the afternoon of this day spores which had been exposed to the frost were placed in water and left until the 26th, by which time nearly every one had germinated. Spores were much scarcer by the beginning of February, but could be germinated in hanging drops. The gathering and germination of spores were continued until March 29, after which date no spores could be found; in every case the spores were capable of germination. Sharp frosts were recorded from January to March, and it is therefore apparent that the spores are capable of resisting a temperature much below freezing-point. This, in a thick-walled spore, is not surprising. Fungi are known to retain their vitality even if subjected to the lowest temperature at present obtainable, as is pointed out for example by BULLER and CAMERON in the case of *Schizophyllum commune*.*

It is probable that the spores of the fungus are distributed by means of wind and rain from one leaf to another during the summer and winter, or they may fall to the ground, where they remain in a resting state, ready to start the disease in the spring and summer.

The thick-walled masses of hyphæ observed in the diseased leaves in February which were capable of sending forth hyphæ are also a means by which the fungus may be continued from one season to the

* *Trans. Brit. Mycol. Society*, iv. (1913), p. 106.

next ; and by this means also, if the plants are distributed in the spring with the previous year's diseased leaves attached, the fungus is carried from place to place.

It is of the utmost importance that, wherever Irises are grown, a very careful watch should be kept for the first appearance of the disease. In the first season the actual damage done may appear small, and fatal neglect may ensue ; for when once the disease seriously establishes itself, as it does in a season or so, its ravages become worse and worse, and its eradication becomes a matter of difficulty.

All varieties of so-called " German " Irises do not appear to be affected in equal degree. Mr. R. J. WALLIS, of Colchester, kindly forwarded me a list in which the strongly attacked varieties are

Thorbecke	Innocenza
Alcazar	Mrs. Darwin
Chelles	Ossian.
Darius	

The varieties which were less seriously harmed are

Gracchus	Mrs. Neubronner
Jacquiniiana	nepalensis
Madame Chereau	Princess of Wales
Albert Victor	Prosper Langier.

The varieties least affected are

pallida dalmatica	Victorine.
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Treatment of the Disease.—I am indebted to Mr. F. J. CHITTENDEN for the following account of the Iris disease at the Royal Horticultural Society's Gardens, Wisley :—

" In 1907 and 1908 the collections of Irises at Wisley were very badly attacked by the fungus *Heterosporium gracile*. So great was the damage done through the premature death of the diseased parts that the plants were seriously weakened, and at the same time the yellow spotting of the foliage through the attack of the fungus even early in the year made the plants very unsightly. In the latter year an attempt was made to cope with the disease by spraying with copper fungicides, ammoniacal copper carbonate particularly being used, but although the disease was checked to some extent it broke out again in the succeeding year with at least equal virulence. Spraying was again resorted to, the spray being applied every three weeks, but still without curing it. It was evident that the disease could not be stamped out by this means, probably because of (1) failure to wet the waxy leaves with the spray fluid at all completely, (2) the faculty the fungus possesses of growing on dying foliage, and (3) possibly also upon any organic matter in the soil. The first of these difficulties could have been overcome by adding something to the spray fluid which could dissolve the wax, but this could not be done without some risk of damage to the foliage through the removal of this protective covering. The second and third difficulties could in ordinary circumstances be only partially obviated.

"A different method of attack was therefore resolved upon, and in the winter of 1909, after all the dead foliage had been removed as usual, the ground was heavily dressed with slaked lime (the refuse from an acetylene generator being used after allowing it to stand exposed to air for about six weeks), the object in view being to counteract any soil acidity and to encourage the oxidation of organic matter in the soil. Fungi, as a rule, are encouraged by an acid condition of the soil, and the particular one in question is no exception.

"The result surpassed our expectations, for the growth came away clean and healthy in the next spring, and remained so through the season, to the evident advantage of the plants. An occasional winter dressing of lime has been given, and extremely little of the fungus has made its appearance since."

The well-known authority on Iris, Mr. W. R. DYKES, writes me that he is unable to give a very confident answer regarding the disease because he has not kept accurate notes on the subject. "So far, however, as my observation goes, the disease only occurs on lime-loving species, and only when the soil is deficient in lime. At any rate, since I took to dressing my Iris beds with superphosphate in summer to check *Pseudomonas*, and chalk in winter to counteract the acidity, I have practically been free from *Heterosporium*, but whether the phosphate or the lime was really responsible I am unable to say. I have never noticed the disease on the lime-hating Apogons, such as the Sibirica group, and the Californians. . . . I should certainly be inclined to agree that the disease spreads more rapidly in wet seasons, possibly, I suppose, because the plants are then less healthy, for all Pogoniris like a dry summer and autumn. I have not seen the disease in the South of France in heavy soil, calcareous it is true, and very dry in summer. I don't think heavy as opposed to light soil is favourable to the disease, for the general rule is that, given good drainage, Pogoniris species are much happier in a heavy lime soil than in sand."

The extracts from Mr. DYKES' letter are very suggestive when read in conjunction with Mr. CHITTENDEN's note above.

It certainly looks as if the presence or absence of sufficient lime in the soil were a primary factor in determining whether the disease is present or not. What relation is there between calciphilous plants, which become attacked when there is insufficient lime, and calciphobe species, which are immune? There is to be added the fact that a heavy dressing of lime clears the plants of the disease. On the face of it, it suggests itself that the calcicoles are not strong enough physiologically to withstand the disease when they are grown in soil which has insufficient lime. It is well known that all organisms in a weak physiological state are liable to disease, and this of course holds in the case of fungi.* But with the few facts before us it is impossible to go further. It would be interesting to try whether the Apogons are really immune, and also whether a calcicolous species supplied with sufficient lime can become diseased.

* Cf. F. T. BROOKS, "Observations on the Biology of *Botrytis cinerea*," *Ann. Bot.* xxii. (1908), p. 482.

SUMMARY AND CONCLUSIONS.

The leaf-blotch disease of Iris (*Heterosporium gracile*) occurs on many different species. The affected leaf fades much before the normal time, and, quite apart from the unsightly appearance, it is obvious that the shortening of the period during which photosynthesis takes place is exceedingly harmful to a plant which stores up food reserves for the next season's growth. The fungus can pass through the winter in its fruiting form, and the spores are capable of germination even after twenty-four degrees (F.) of frost. Also, as is usual with many fungi, the other parts of the fungus are capable of regeneration, and thus of forming a new centre for the spread of the disease. It is obvious that all old leaves should be gathered and burned. A dressing of slaked lime put on in autumn and lightly forked in in spring has been found to be efficacious in eradicating the disease. Further it would seem that the disease particularly affects lime-loving species when the soil is deficient in lime, but not lime-hating species.

The spores germinated in hanging drops of various substances, and pure cultures were grown on preparations of agar-agar.

Inoculations of living plants were successful, and showed that the germ tube of the spore can pass through either the epidermis or stomata of the host, and gives rise to mycelium which is both intercellular and intracellular, but which does not possess haustoria. The fungus completed its life cycle in these cases.

An investigation of the previous accounts of the fungus has shown that the attribution of the first description to WALLROTH is incorrect, his fungus being a species of *Brachysporium*.

An attempt was made to inoculate Narcissus, as the fungus is said to be the cause of a serious disease on the Continent. The attempt failed.

Unfortunately, owing to leaving Wisley, I was unable to continue the investigation as far as I should have wished. One of the points which would probably have repaid attention was the unsuccessful attempt to inoculate Narcissus. A large number of such attempts would have shown whether the failure was due to the conditions not having been the correct ones or whether other genera are immune to the fungus from Iris. Is there a specialization of parasitism similar to the one which is now so well known, particularly in the Uredinales, or are there two different species which are very closely allied morphologically and which have both been included in the same species?

In conclusion the writer wishes to express his sincerest thanks to Mr. F. J. CHITTENDEN, F.L.S., for suggesting this investigation, and for his constant help; to Mr. T. E. ROONEY, of the National Physical Laboratory, for photographs, except the slant culture, for which his thanks are due to Mr. A. E. MALBY, F.R.P.S.; to Mr. W. R. DYKES, M.A., Charterhouse, Godalming, for his kindness in answering certain queries; to Mr. R. J. WALLIS for the list of varieties affected by the disease; and to his brother, Mr. J. RAMSBOTTOM, M.A., F.L.S., of the Natural History Museum, for help in many ways.

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THE WISLEY GARDENS ENDOWMENT FUND.

DEED OF DECLARATION OF TRUST BY THE ROYAL HORTICULTURAL SOCIETY.

TO ALL TO WHOM these Presents shall come the Royal Horticultural Society (hereinafter called "the Society") sends greeting WHEREAS the Society is a Corporation incorporated and constituted by Royal Charters or Letters Patent dated respectively the seventeenth day of April One thousand eight hundred and nine the eighth day of May One thousand eight hundred and sixty and the fourteenth day of November One thousand eight hundred and ninety nine for the purpose of the encouragement and improvement of scientific and practical horticulture in all its branches with power to acquire hold deal with and dispose of any personal property whatsoever and under the said Charter of the fourteenth day of November One thousand eight hundred and ninety nine the Society consists of Fellows or Members and the Government of the Society and of its business and affairs is vested in a Council consisting of fifteen persons being Fellows of the Society and the Council has power (with the sanction of a majority of a General Meeting of the Society) from time to time to make Bye Laws for the Society (not being repugnant to the provisions of the said Charter) and from time to time to revoke alter or amend any bye law AND whereas by an Indenture dated the ninth day of September One thousand nine hundred and three and made between Bernard Alexander Wilson John Griffin Bristow and Herman George Wilson of the one part and Cecil Hanbury Ellen Willmott and John Thomas Bennett-Poe of the other part certain freehold hereditaments and premises comprising Sixty acres or thereabouts situate in the Parish of Wisley in the County of Surrey (which hereditaments and premises are hereinafter called "the Wisley Estate") were conveyed unto and to the use of the said Cecil Hanbury Ellen Willmott and John Thomas Bennett-Poe in fee simple AND whereas by an Indenture of Declaration of Trust dated the twenty fourth day of September One thousand nine hundred and three and made between the said Cecil Hanbury Ellen Willmott and John Thomas Bennett-Poe of the first part Sir Thomas Hanbury of the second part the said Cecil Hanbury Ellen Willmott and John Thomas Bennett-Poe and Sir James John Trevor Lawrence Joseph Gurney Fowler and the Reverend William Wilks of the third part and the Society of the fourth part they the said Cecil Hanbury Ellen Willmott and John Thomas Bennett-Poe declared that they and the survivors and survivor of them and the heirs and assigns of such survivor did and should stand

and be seised of the Wisley Estate upon the trusts therein set forth including (Clause 1) a trust thenceforth (during the existence of the Society or until the receipt of such notice as therein mentioned) to permit the Society to use and occupy the Wisley Estate or such portion thereof as the Society might require for the purposes of an experimental Garden and the encouragement and improvement of scientific and practical horticulture in all its branches and it was thereby provided (clause 3) that the Society should during the existence of the said trust in the Society's favor pay and discharge all outgoings in connection with the Wisley Estate AND WHEREAS since the date of the last recited Indenture the Society has used and occupied the Wisley Estate in accordance with the terms of clause 1 of the said Indenture and has expended considerable sums in buildings and improvements on the Wisley Estate AND WHEREAS the Society desires to extend its scientific and research and other work on the Wisley Estate and to make provision for the carrying on of such work in the future (whether on the Wisley Estate or on any other land which may at any time hereafter be acquired by or for or given or let to or placed at the disposal of the Society for the purposes of any such work) in a permanent and continuous manner and for that purpose the Society has determined to allocate and establish the Fund hereinafter mentioned and to accept contributions and bequests thereto to the intent and so that the said fund shall be held by the Society upon the trusts and in manner hereinafter appearing NOW THESE PRESENTS WITNESS and the Society hereby declares as follows :

1. THE Society or other the Trustee or Trustees for the time being of these presents (hereinafter together called " the Trustee or Trustees ") does and shall henceforth hold FIRST the sums of Stock debentures and bonds specified in the Schedule hereto which have been and are hereby allocated and given for this purpose by the Society out of its General Funds or property AND SECONDLY all contributions (whether by way of subscription donation bequest or otherwise howsoever) which may at any time or times hereafter be made given or bequeathed to the Trustee or Trustees (or may be appropriated or set aside) for the same purpose by the Society or by any other body or by any person or persons (which sums of stock debentures and bonds and contributions and all investments and property for the time being representing the same or any part or parts thereof respectively are hereinafter together called " the Wisley Gardens Endowment Fund ") upon the trusts and for the purposes and with and subject to the powers and provisions hereinafter expressed and contained concerning the same

2. THE Trustee or Trustees shall use apply and expend the whole or such part or parts of the income (but not the capital) of the Wisley Gardens Endowment Fund for all or such one or more of the following purposes and in such manner in all respects in relation to those purposes as the Society shall from time to time direct that is to say (1) The erection or the repair rebuilding renewal maintenance upkeep or

insurance of any buildings or erections of any kind on any land (including not only the Wisley Estate but also other land wheresoever situate) for the time being used or occupied by the Society for an experimental ornamental or practical garden or for scientific research educational or practical work in connection with scientific or practical horticulture in any branch and the payment of all outgoings in connection with any such buildings erections or land (ii) The laying out plantation fertilization clearing preparing drainage alteration of levels or improvement of or the making of roads or footpaths upon or through any such land as aforesaid (iii) The provision or installation or the repair renewal maintenance upkeep or insurance of any tools implements instruments apparatus machinery fixtures materials manures chemicals furniture or equipment of any description proper for use in connection with any such buildings erections or land as aforesaid or for the carrying on therein or thereon of any scientific or research or practical or educational work connected with horticulture in any branch or for the comfort or convenience of any person engaged there in such work (iv) The payment of salaries or wages or pensions to any persons for the time being or formerly so engaged in any such work as in sub-clause (iii) of this clause is mentioned

3. THE Trustee or Trustees shall and may invest any moneys requiring to be invested under these presents in the name or names or under the legal control of the Trustee or Trustees in or upon such investments or securities of whatsoever nature and wheresoever and whether payable to bearer or not and upon such terms in all respects as the Trustee or Trustees in its his or their absolute and uncontrolled discretion shall think fit with power in its his or their like discretion from time to time to vary and transpose the investments so made and also the investments specified in the Schedule hereto it being intended and hereby declared that the Trustee or Trustees shall not be restricted to investments authorised by law for trust funds or to any other class or description of investment but shall have the same full and unrestricted powers of investing and varying and transposing investments as if the Trustee or Trustees were absolutely and beneficially entitled to the said moneys and the investments thereof and the said investments specified in the Schedule hereto and shall also have power pending investment to deposit any such moneys at a Bank at interest or otherwise without in any case being liable for any loss thereby occasioned

4. THE Trustee or Trustees shall have power to apportion blended trust funds and expenses and to decide whether any moneys or expenses are to be treated as or paid out of or are attributable to capital or income and how valuations ought to be made or how value ought to be determined for any purposes connected with the trusts of these presents And every such apportionment or decision of the Trustee or Trustees whether made upon a question formally or actually raised or implied in any act or proceeding of the Trustee or Trustees

shall be conclusive and binding upon all persons or bodies interested hereunder

5. THE Trustee or Trustees in its his or their discretion may in any case instead of acting personally employ and pay a Solicitor Banker Broker Accountant or any other agent to transact any business whatever required to be done in the premises (including the receipt and payment of money but not the exercise of any discretion) without being liable for the default of any such Agent or for any loss occasioned by his employment And any person who for the time being may be a Fellow or Member of the Society or a Trustee of these presents may be so employed and shall be entitled to charge and be paid all usual professional or other charges for any work done by him or his firm in connection with the trusts of these presents (whether or not in the ordinary course of his profession or business and although not of a nature requiring the employment of a professional person or agent) in the same manner and to the same extent as if he were a stranger

6. THE Society (whether acting as Trustee or as beneficiary or otherwise) shall for all the purposes of these presents act by the Council of the Society as constituted regulated and empowered by the said Charter of the fourteenth day of November One thousand eight hundred and ninety nine (or any other Charter hereafter to be granted to the Society or any Act of Parliament) and by the bye laws of the Society for the time being in force

7. IF and when the Society shall cease to exist the powers and interest of the Society hereunder and the trusts hereinbefore contained shall cease and determine and the Trustee or Trustees shall thenceforth hold the Wisley Gardens Endowment Fund and the income thereof upon trust to apply the same for the purpose of the encouragement and improvement of scientific and practical horticulture in all its branches in such manner as the Trustee or Trustees shall think fit with power for the Trustee or Trustees to transfer and make over the same to any authority body Institution or persons which or whom the Trustee or Trustees may select to be held and applied by such transferees for the purpose aforesaid

IN WITNESS whereof the Royal Horticultural Society has caused its Common Seal to be hereunto affixed this seventh day of April One thousand nine hundred and fourteen

THE SCHEDULE ABOVE REFERRED TO

£3500	4 per cent. Debenture Stock of the Great Eastern Railway Company
£2000	5 per cent. 10 year Terminable Debentures of the Leopoldina Railway Company Limited
£6000	4½ per cent. Bonds 1912 of the City of Moscow
£2500	5 per cent. Non-cumulative Preference Stock of the Buenos Ayres Great Southern Railway Company Limited

- £6000 4 per cent. 30 year Gold Debentures of the New York Central
and Hudson River Railroad
- £5000 4 per cent. Gold Bonds of the Northern Pacific-Great Northern
Railway Companies
- £135.8.4 London County 3½ per cent. Consolidated Stock

THE COMMON SEAL of the above named Royal Horti-
cultural Society was hereunto affixed at a Meeting of
the Council held on the seventh day of April 1914
in the presence of



GRENFELL

President

J. GURNEY FOWLER

Treasurer

W. WILKS

Secretary

WISLEY SCHOOL OF HORTICULTURE.

THIRTY-TWO students attended the R.H.S. School of Horticulture at Wisley during the past year. Eight completed their two years' course during the year and sat for the Diploma, the requirements for which, besides the examinations (written and practical) in both principles and operations of horticulture, include the preparation of an essay upon an approved subject connected with horticulture, the preparation of collections of British plants and insects useful or injurious in horticulture, and credit for observation during the two years' course. Mr. J. Fraser, F.L.S., acted as external co-examiner with the Staff of the School.

Six students satisfied the Examiners, and were awarded the Diploma, their names, in order of merit, being :—

1. Mr. R. J. Dix.
2. Mr. C. C. Titchmarsh.
3. Mr. A. N. Rawes.
4. Mr. M. P. Scase.
5. Mr. W. V. Pitts.
6. Mr. G. M. Owen.

Seventeen students passed the Society's General Examination in April 1914. As a result of this examination, Mr. G. F. Wilson was awarded the Scholarship offered annually by the R.H.S. and the Gardeners' Company alternately, for competition at that examination.

The following prizes (books) were awarded on the result of the Diploma Examination :—

Prizes to the value of 23s. 6d., 18s. 6d., 14s., and 14s. to Messrs. Dix, Titchmarsh, Rawes, and Scase respectively.

"Nicholson" Prize, of the value of £2 2s., for observation on the Flora and Fauna of the Wisley district, to Mr. R. J. Dix.

Twelve students and ex-students sat for the Preliminary Examination for the newly-established National Diploma in Horticulture, of whom four were placed in Division A and seven in Division B (see p. 112).

CHINA ASTERS AT WISLEY, 1914.

REPORT BY C. C. TITCHMARSH, Trials Officer.

THE seeds of one hundred and ninety-four varieties of China Asters (*Callistephus*) were received during the spring of 1914. They were sown under glass on April 27, the germination being, on the whole, good. The seedlings were pricked out into frames and transplanted, 18 inches apart, on June 9 into the open ground. The site had been trenched and manured in the previous autumn. Notwithstanding a long spell of dry weather, the plants made excellent progress, and were examined by the Floral Committee on August 28.

The varieties fall into the following classes :—

I. Flowers single.

(i.) *Ray florets flat* :—

The form known as *C. sinensis* in catalogues, and its colour forms. Habit much branched, flowers borne at the apex of long, drooping stalks.

(ii.) *Ray florets quilled* :—

The 'Elegance' aster (fig. 109, *i*). A rather late-flowering group of erect, almost fastigiate habit, little branched above the base; stems more or less coloured except in the white or very pale-flowered varieties. Flowers held horizontally, 4-4½ inches in diameter, disc deep yellow. The varieties of this type are remarkable for their uniformity of habit and stature.

II. Flowers double.

(i.) *Florets flat* :—

(a) 'Comet' (fig. 108, *a*). Habit of the plants is very variable. Flower at right angles to its stalk; ray florets recurved and curled at apex. The 'Comet' proper (fig. 108, *a*) has the disc hidden by small, curved florets. There are two variations from this type.

a. 'Ostrich Plume' or 'Plume' (fig. 108, *b*), a hemispherical flower with the disc almost absent and the inner ray florets highly developed.

β. 'Hohenzollern' (fig. 108, *c*), a 'Comet' with a distinct disc and recurved ray florets.

These two forms are to a large extent dependent on the age of the flower; a 'Plume' may become a 'Comet' or even a 'Hohenzollern' as the flower expands.

(b) 'Victoria' (fig. 108, *c*). Habit very variable. Flower held at right angles to its stalk, the closely packed ray florets short, broad, and reflexed at apex. This is the most formal type of aster.

The 'Christmas Tree' type has numerous branches drooping near tip, the whole forming a pyramid.

(c) 'Chrysanthemum-flowered.' A 'Victoria' with straight florets.

(d) 'Pæony' (fig. 108, d). Habit dwarf and compact. Flowers usually small, with incurved florets.

(ii.) *Florets quilled* :—

(a) 'Branching Aster' (fig. 109, f). A late-flowering type. Flowers solitary on long, stiff stalks, arising chiefly above the middle of the stem. Flower-stalk curved just below the involucre, so that flower becomes vertical. Flower massive, with rather short semi-quilled florets. This appears to be a delicate race, as the germination was in all cases poor; in many it failed.

(b) 'Unicum' or 'Needle Aster' (fig. 109, g). Plants much branched, and flowers often drooping. Ray florets straight and short; centre often congested with a mass of deformed florets. Not an attractive type.

(c) 'Ray' (fig. 109, h). A somewhat rare type of aster; it is best described as a comet with quilled florets.

In the following descriptions the measurement given after "habit" refers to the height; that given after the type of flower refers to the diameter.

The colours and their index numbers are from "Ridgway's Colour Standards."

The Trials Officer is indebted to Dr. KEEBLE and Mr. S. T. WRIGHT for much help in the preparation of this Report.

The Floral Committee considered the following to be the best varieties in the trial :

White.

- 35. Comet, snow white.
- 86. Giant Comet, pure white.
- 119. New Giant White Hercules.
- 192. White Wonder.

Pale Pink.

- 34. Comet, shell pink.
- 93. Giant Comet, The Bride.
- 120. New Giant Hohenzollern, shell pink.
- 189. Victoria, white, tinted rose.

Red-purple.

- 42. Dwarf Pæony-flowered Perfection, dark scarlet.
- 43. Dwarf Pæony-flowered Perfection, dark scarlet and white.
- 79. Giant Comet, fiery scarlet.
- 90. Giant Comet Ruby.
- 99. Gloria.
- 139. Ruby.
- 166. Victoria, carmine rose.
- 171. Victoria, dark scarlet.

Tyrian Pink.

- 48. Dwarf Pæony-flowered Perfection, rose.
- 102. Hohenzollern, brilliant rose.

Blue.

- 56. Elegance, lavender.
- 81. Giant Comet, light blue.
- 95. White, turning to amethyst blue.
- 146. The Prince.

Violet.

- 36. Comet, pale lavender-blue.
- 38. Dwarf Pæony-flowered Perfection, black blue.
- 39. Dwarf Pæony-flowered Perfection, black violet.
- 44. Dwarf Pæony-flowered Perfection, light blue.
- 169. Victoria, dark blue.

Yellow.

- 129. New Yellow Sunlight.
- 147. Toison d'Or.

A.M.—Award of Merit.

XXX.—Highly Commended.

XX.—Commended.

1.* Aurora (Hurst), **XXX** August 28, 1912.—Habit erect, 24 inches ; flower Comet, 3½ inches ; centre good, florets straight, pale rose pink (71 g).

2. Autumn Queen, bright rose (Barr).—Habit loose, 20 inches ; stems rather long ; flower Victoria, 3 inches ; centre poor, deep Tyrian pink (69 b), scorches rather badly. A late variety.

3. Autumn Queen, snow white (Barr).—Habit loose 18-20 inches ; stems long ; flower chrysanthemum white, 3 inches.

4. Autumn Queen, soft lavender-blue (Barr).—Habit loose, 20 inches ; stems long ; flower a semi-double form of *sinensis* ; 85 per cent. true.

5. Branching Aster, carmine (R. Veitch).—Failed.

6. Branching Comet, crimson (Carter).—Habit bushy, branching from the base, 24 inches ; flower Comet, 3½ inches ; florets rather delicate, deep mallow purple (67 a).

7. Branching Aster, crimson (R. Veitch).—Failed.

8. Branching Comet, dark blue (Carter).—Failed.

9. Branching Aster, dark blue (R. Veitch).—See ' Branching Aster ' in introduction. Flower 3½ inches ; hyacinth-violet (69 i).

10. Branching Aster, dark violet (R. Veitch).—Failed.

11. Branching Aster, indigo (R. Veitch).—Failed.

12. Branching Comet, lavender (Carter).—Habit bushy, 24 inches ; flower Comet, 5 inches ; light lavender-violet (61 e). A very late variety.

13. Branching Aster, lavender (R. Veitch).—Failed.

14. Branching Comet, light blue (Carter).—Failed.

15. Branching Comet, light pink (Carter).—Habit bushy, 20 inches ; flowers Comet, 4 inches ; florets much reflexed and twisted ; a mixture of lilac shades. A late variety.

16. Branching Aster, pale yellow (R. Veitch).—Habit loose, 22 inches ; flower-stalk long spreading ; flower Victoria, held horizontally 3½ inches ; inner florets quilled, cream.

17. Branching Comet, rose (Carter).—Habit bushy, 24 inches ; flower Comet, 4 inches ; rather rough with much-distorted inner florets, amaranth pink (69 d). About 50 per cent. true, the remainder white.

18. Branching Aster, salmon rose (R. Veitch).—Failed.

19. Branching Aster, shell pink (R. Veitch).—The form and stature of 16. Flowers of a delicate shell pink.

20. Branching Comet, shrimp pink (Carter).—Habit bushy, 24-26 inches ; flower Comet, 5 inches ; pale Châtenay pink (3' f). A late variety.

21. Branching Aster, white (R. Veitch).—Failed.

22. Branching Comet, white (Carter).—Habit loose, 20 inches ; flower semi-quilled, centre congested, white. A poor, late variety.

* Number under which plant was known until judgment was passed.

23. Branching Yellow (Dawkins).—Habit bushy, 26 inches ; flower-stalk long ; flower Victoria, $3\frac{1}{2}$ inches ; faint primrose yellow.

24. Carter's Perfection, crimson (Carter).—Habit lax, 22 inches ; flower-stalk long ; flower Victoria, 3 inches ; rhodamine purple (67).

25. Carter's Perfection, pinkish lilac (Carter).—Habit lax, 24 inches ; flower Victoria, $3\frac{1}{2}$ inches, white, with a flush of mallow pink (67 a). Flower resembles 122, but less pink.

26. Carter's Perfection, purple (Carter).—Form and stature of 25 ; flower 4 inches, amethyst violet (61).

27. Carter's Perfection, rose (Carter).—Form and stature of 25 ; flower 4 inches, mallow purple (67 b).

28. Celestine (Barr).—Habit erect, 24 inches ; flower Comet, 4 inches, light lavender (59" d). Very like 96 ; 58 per cent. true.

29. Christmas Tree, light blue (Heinemann).—Failed.

30. Christmas Tree, pink (Heinemann).—Flowers of the Victoria type, and vary from $1\frac{1}{2}$ – $2\frac{1}{2}$ inches in diameter ; a deep shade of amaranth pink (69 d).

31. Christmas Tree, white (Heinemann).—See 30. The flowers are white. The stock is 83 per cent. true.

32. Comet or Plume, blood red (Barr).—Habit erect, 15 inches ; very floriferous ; flower Comet, $2\frac{3}{4}$ inches ; amaranth purple (69 i). Stock very variable in height.

33. Comet, Empress Frederick (R. Veitch).—Habit bushy, 15 inches ; flower Hohenzollern, $4\frac{1}{2}$ inches ; florets much reflexed ; disc very small, white. Stock 75 per cent. true.

34. Comet or Plume, shell pink, shaded white (Barr), **A.M.** August 28, 1914.—Habit bushy, compact, 12 inches ; free-flowering ; flower plume $3\frac{1}{2}$ inches, white, just flushed with rose pink. Stock very regular in height. An excellent bedding variety.

35. Comet or Plume, snow white (Barr), **XXX** August 28, 1914.—Habit erect, 18 inches ; flower Comet, 4 inches, white. A very good variety ; 92 per cent. true.

36. Comet or Plume, pale lavender blue (Barr), **XXX** August 28, 1914.—Habit erect, 18 inches ; flower Plume $4\frac{1}{2}$ inches, Bradley's violet (59'). One of the best blues in the trial.

37. Diadem (R. Veitch).—Habit bushy, 12 inches ; flower Plume $3\frac{1}{2}$ inches, deep hortense violet (61 a).

38. Dwarf Pæony-flowered Perfection, black-blue (Heinemann), **XXX** August 28, 1914.—Habit bushy, compact, 14–16 inches ; flower Pæony, 3 inches, a very vivid shade of amethyst violet (61).

39. Dwarf Pæony-flowered Perfection, black violet (Heinemann), **XX** August 28, 1914.—Habit bushy, compact, 14 inches ; flower Pæony, 3 inches, naphthalene violet (61" l).

40. Dwarf Pæony-flowered Perfection, crimson (Heinemann).—Habit erect, 15–18 inches ; flower Pæony, 3 inches, rhodamine purple (67 a) ; 75 per cent. true.

41. Dwarf Pæony-flowered Perfection, dark purple (Heinemann).—Habit erect, 14 inches ; flower Pæony, $2\frac{1}{2}$ inches ; florets pansy purple

(69 k), those of the two outer whorls with white margin ; 83 per cent. true.

42. Dwarf Pæony-flowered Perfection, dark scarlet (Heinemann), **XXX** August 28, 1914.—Habit bushy, compact, 14 inches ; flower Pæony, 2 inches, bright amaranth purple (69 i).

43. Dwarf Pæony-flowered Perfection, dark scarlet and white (Heinemann), **XXX** August 28, 1914.—Habit bushy, compact, 14 inches ; stems bright red-brown ; flower Pæony, 2½ inches, pomegranate purple ; florets white, with central rosy midrib ; 92 per cent. true.

44. Dwarf Pæony-flowered Perfection, light blue (Heinemann), **XX** August 28, 1914.—Habit bushy, compact, 14 inches ; flower Pæony, 3 inches, Bradley's violet (59').

45. Dwarf Pæony-flowered Perfection, light carmine (Heinemann).—Habit bushy, compact, 14 inches ; flower Pæony, 3½ inches, deep Tyrian pink (69 b) ; 75 per cent. true.

46. Dwarf Pæony-flowered Perfection, lilac red (Heinemann).—Habit bushy, compact, 14 inches ; flower Pæony, 2¾ inches, light violet purple (63 a).

47. Dwarf Pæony-flowered Perfection, purplish violet and white (Heinemann).—Habit bushy, compact, 15 inches ; flower Pæony, 2¼ inches ; florets pansy purple (63 i), with white margins ; 90 per cent. true.

48. Dwarf Pæony-flowered Perfection, rose (Heinemann), **XXX** August 28, 1914.—Habit bushy, compact, 14 inches ; flower Pæony, 3 inches, Tyrian pink (69 b), fades rather quickly.

49. Dwarf Pæony-flowered Perfection, snow white (Heinemann).—Habit bushy, compact, 15 inches ; flower Pæony, 2½ inches, white ; 83 per cent. true.

50. Eclipse, white (Sydenham).—Habit lax, 20 inches ; flower Ray, 4¾ inches, white.

50A. Eclipse, rose (Sydenham).—Identical in form with 50, but the flower is of amaranth pink (69 d) instead of white.

51. Elegance, dark blue (Heinemann).—For description of type see introduction. Flower hortense violet (61 b).

52. Elegance, dark blue (Cartwright & Goodwin).—Habit and stature of *sinensis* ; flower 2¾ inches ; ray florets in two whorls ; amethyst violet (61).

53. Elegance, dark blue and white (Heinemann).—Type as 51. Ray florets white at base, passing to lavender-violet (61' b) at tips.

54. Elegance, carmine rose (R. Veitch).—Type as 51. Ray florets rose colour (71 b).

55. Elegance, dark blue (R. Veitch).—Type as 51. Ray florets deep hortense violet (61 b).

56. Elegance, lavender (Cartwright & Goodwin), **XXX** August 28, 1914.—Not of the Elegance type, but, like 52, a form of *sinensis*. Flowers lavender-violet 61' d, with a very bright yellow disc.

57. Elegance, lavender (R. Veitch).—Type as 51. Ray florets very pale blue, almost white.

58. Elegance, lavender-blue (Heinemann).—Identical with 57.

59. Elegance, light blue (R. Veitch).—Type as 51. Ray florets light hortense violet (61 b).

60. Elegance, light rose (Heinemann).—Type as 51. Ray florets pale amaranth pink (69 e). Identical with 63.

61. Elegance, rose (Heinemann).—Type as 51. Ray florets deep Tyrian pink (69 b).

62. Elegance, rose pink (Cartwright & Goodwin).—Like 52 and 56, this variety is not an Elegance aster, but a colour form of *sinensis*. Ray florets Tyrian pink (69 b).

63. Elegance rose and white (Heinemann).—Identical with 60.

64. Elegance, white (Heinemann).—Type as 51. Ray florets white.

65. Elegance, white (R. Veitch).—Identical with 64.

66. Dwarf Chrysanthemum mixed (Simpson).—Habit bushy, 9–15 inches; flowers flat; florets incurved, inner linear, laciniate. A mixture of shades of blue and pink and some white.

67. Giant Comet mixed (Simpson).—Habit bushy, 18–20 inches; flowers $3\frac{1}{2}$ inches; with large ugly discs and ray florets of various colours.

68. Ostrich Plume mixed (Simpson).—A poor mixture of forms, but mostly Comets with pronounced discs varying greatly in height.

69. Pæony-flowered, mixed (Simpson).—Habit erect, 18–20 inches. A mixture, chiefly blue shades of the Pæony type.

70. Victoria mixed (Simpson).—A mixture varying in height and habit. The flowers are Victoria, with pronounced discs.

71. Giant Comet, anilin rose (Heinemann).—A poor mixture; plants varying in type, habit, and colour; 60 per cent. are Comets.

72. Giant Comet Amethyst, white to blue (Barr).—Habit bushy, 20–24 inches; flower Comet, $4\frac{1}{2}$ inches, at first white, becoming light hortense violet (61 d) as it ages.

73. Giant Comet, ageratum blue (Heinemann).—Habit erect, 20 inches; flower Comet, $3\frac{1}{2}$ inches; deep lavender-violet (61" d).

74. Giant Comet, brilliant carmine (Heinemann).—Habit erect, 30 inches; flower Comet, $4\frac{1}{2}$ inches; centre congested with short, malformed florets, Tyrian rose (69). Stock only 58 per cent. true. The rogues do not exceed 15 inches in height.

75. Giant Comet, crimson (Heinemann).—Habit erect, 18–20 inches; flower Comet, $4\frac{1}{2}$ inches; bright rhodamine purple (67). Stock only 57 per cent. true.

76. Giant Comet, dark blue (Cartwright & Goodwin).—Habit variable, 18–24 inches; flower Comet, loose, 4 inches; amethyst violet. A late variety; 92 per cent. true for flower colour.

77. Giant Comet, dark blue (Heinemann).—Habit erect, 24 inches; flower plume comet, 4 inches; bright hyacinth violet, (61 i), but paler when very young. Stock 86 per cent. true. The flowers possess an attractive silvery appearance.

78. Giant Comet Fairy Queen (Heinemann).—A mixture of types

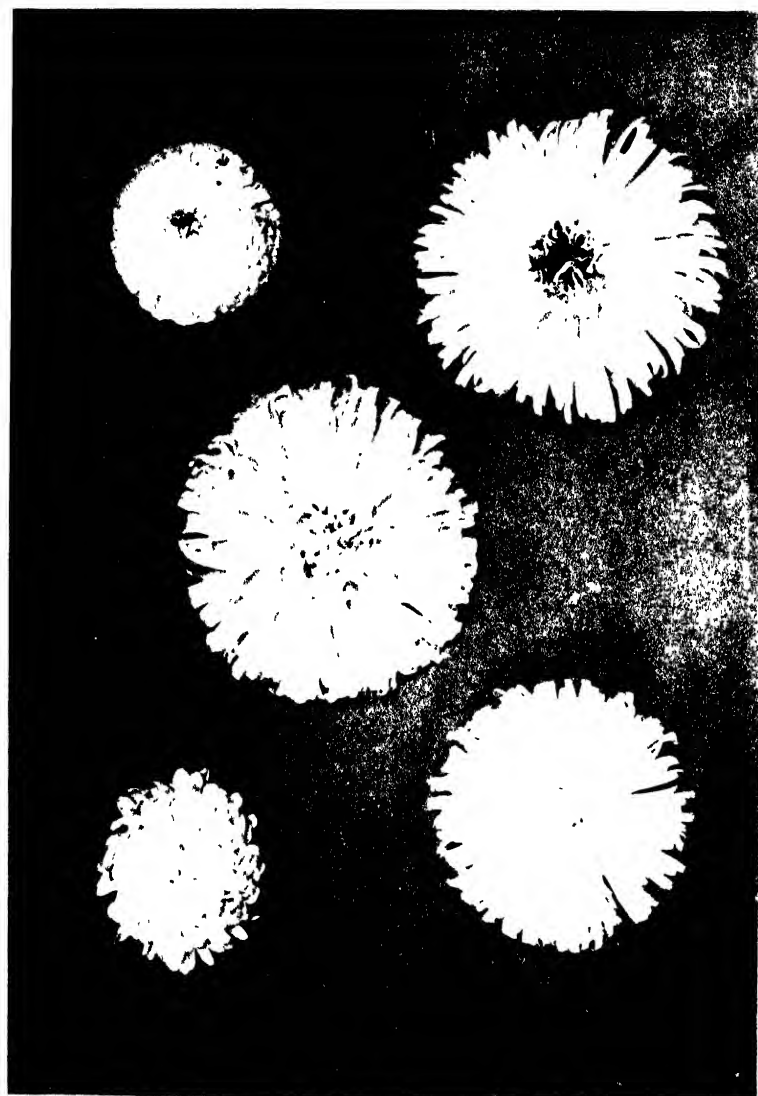


FIG. 108.—TYPES OF CHINA ASTERS

a, Comet; *b*, Plume; *c*, Hohenzollern; *d*, Paony; *e*, Victoria

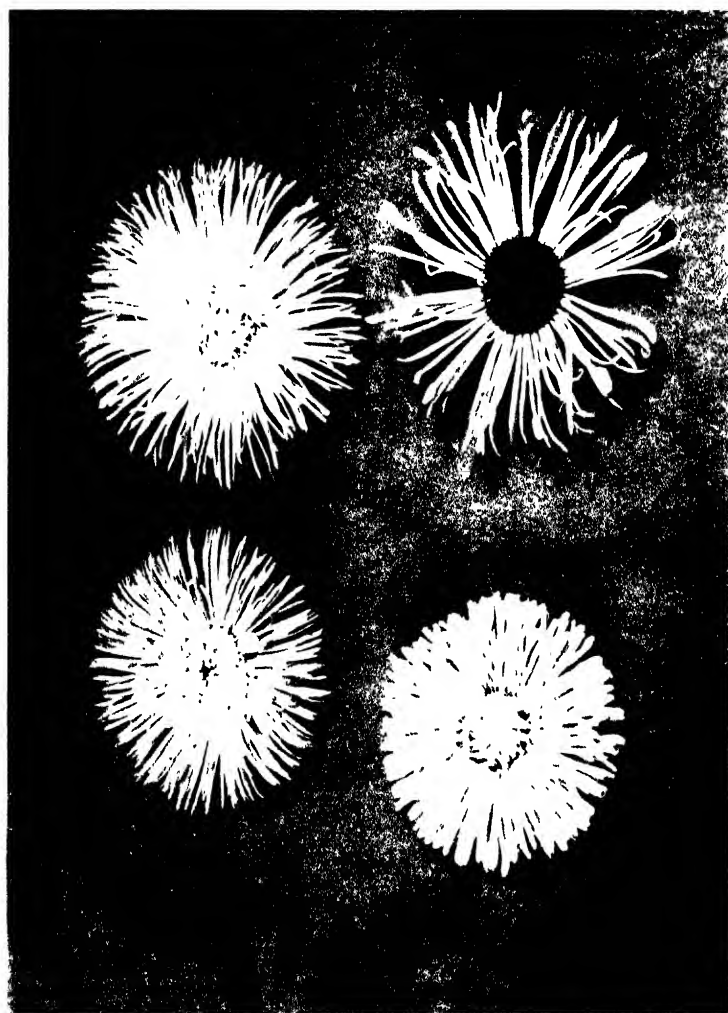


FIG. 109.—TYPES OF CHINA ANISES.
f, Branching g, Uncum h, Ray i, Elegance.

and colours. Nothing predominates sufficiently to determine the variety, but 28 per cent. of the plants bear dull pink, Comet flowers.

79. Giant Comet, fiery scarlet (Heinemann), **XXX** August 28, 1914.—Like No. 90, but only 83 per cent. true.

80. Giant Comet, light blue (Cartwright & Goodwin).—Habit very bushy, 20 inches; flower Comet, 4 inches; light lilac (65' d). Centre is variable, but usually well filled.

81. Giant Comet, light blue (Heinemann), **XXX** August 28, 1914.—Habit erect, 24 inches; flower Comet, good, $3\frac{1}{2}$ inches; bluish lavender (57" a). One of the best of the lavender-coloured varieties.

82. Giant Comet, light lilac (Heinemann).—Habit erect, 22 inches; flower Plume, 4 inches; light lavender violet (61 f). A large, heavy flower. Stock 58 per cent. true.

83. Giant Comet, mixed (Sydenham).—Habit erect, 25 inches; flower Comet, mixed colours, large disc.

84. Giant Comet, pale yellow (Heinemann).—Habit erect, 18 inches; flower Hohenzollern, $3\frac{3}{4}$ inches; faint primrose, but quickly bleaches. Size of disc variable.

85. Giant Comet, pink (Cartwright & Goodwin).—Habit erect, 18 inches; flower Comet, 4 inches; pale pinkish mauve (63' g); 42 per cent. true.

86. Giant Comet, pure white (Heinemann), **XXX** August 28, 1914.—Habit bushy, 18–20 inches; flower Comet, good centre, well built, 4 inches; pure white.

87. Giant Comet, Queen of Spain (Heinemann).—Habit erect, 20 inches; flower Comet, $4\frac{1}{2}$ inches; blush. A rather pretty variety, with an ugly disc.

88. Giant Comet, rose (Heinemann).—Habit erect, 22 inches; flower Comet, 4 inches; amaranth pink (69 d).

89. Giant Rose (Barr).—Habit erect, 16 inches; flower Victoria, with rather straight florets, $3\frac{1}{2}$ inches; amaranth pink (69 d).

90. Giant Comet, ruby (Barr), **A.M.** August 28, 1914.—Habit erect, 20 inches; flower approaches the Ray type, but the florets are but slightly quilled, 4 inches; bright amaranth purple (69 i). An extremely handsome variety. See also 79.

91. Giant Comet, ruby (Heinemann).—55 per cent. were identical with No. 90; the remainder were various-coloured comets.

92. Giant Comet, salmon rose (Heinemann).—Habit erect, 15 inches; flower Comet, $3\frac{1}{2}$ inches; rose pink (71 f). An early variety.

93. Giant Comet, The Bride (Heinemann), **A.M.** August 28, 1914.—Habit erect, 20 inches; flower Plume, white when young, becoming pale phlox pink (65 g) as the flower ages. A good variety.

94. Giant Comet, violet purple (Heinemann).—Habit erect, 19 inches; flower Comet, well-filled centre, $4\frac{1}{2}$ inches; true purple (65); 92 per cent. true.

95. Giant Comet, white, turning to amethyst blue (Heinemann), **XXX** August 28, 1914.—Habit slightly bushy, 20 inches; flower Comet, at first white, changing to light mauve (63' d).

96. Giant Comet, white, turning to azure blue (Heinemann).—Flower like No. 28 but habit bushy, 16 inches.

97. Giant Comet, white (Cartwright & Goodwin).—Habit erect, 24 inches; flower Victoria, $2\frac{3}{4}$ inches; white. A late variety.

98. Giant White (Barr).—Habit erect, 22 inches; flower Victoria, $3\frac{1}{2}$ inches; white.

99. Gloria (Barr), **XXX** August 28, 1914.—Habit bushy, 18 inches; flower Pæony, $2\frac{3}{4}$ inches; amaranth purple (69 i), with the central florets white.

100. Hohenzollern (R. Veitch).—Habit bushy, loose, 18–24 inches; flower Hohenzollern, 4 inches; disc variable. Stock 83 per cent. true.

101. Hohenzollern Crown Prince (Heinemann).—Habit lax, 18 inches; flower Comet, 4 inches; amaranth purple (69 d). This variety closely resembles 103.

102. Hohenzollern, brilliant rose (Heinemann), **XXX** August 28, 1914.—Habit bushy, 18–24 inches; flower Comet, 4 inches; Tyrian pink (69 b). A pleasing variety.

103. Hohenzollern, brilliant salmon rose (Heinemann).—Habit bushy, 17 inches; flower Hohenzollern, amaranth pink (69 d), which fades rather quickly. See 125.

104. Hohenzollern, crimson (Heinemann).—Habit very lax, 21 inches; flower Hohenzollern, $4\frac{1}{2}$ inches; bright mallow purple (67 a). Stock 75 per cent. true.

105. Hohenzollern, dark blue (Heinemann).—Habit loose, height variable; flower Comet, of various colours.

106. Hohenzollern, light blue (Heinemann).—Habit variable; flower Comet, of various shades of blue.

107. Hohenzollern, mixed (Sydenham).—A very early-flowering mixture of the Comet type.

108. Hohenzollern, pink (Heinemann).—Failed.

109. Hohenzollern, pure white (Heinemann).—Habit lax, 20 inches; flower Hohenzollern, $4\frac{3}{4}$ inches; large disc, white. Stock 90 per cent. true. Not a good variety.

110. Hohenzollern, delicate rose (Heinemann).—Habit lax, 20 inches; flower Comet, large, various pale shades of red and blue.

111. Hohenzollern, silver lilac (Heinemann).—Habit bushy, 19 inches; flower Comet, about $3\frac{1}{2}$ inches; mixed pale pink, mauve, and blue flowers.

112. Hohenzollern, white, tinted rose (Heinemann).—Habit variable, height variable; flower Comet, white, just tinged rose pink. Stock 67 per cent. true.

113. Lady in White (R. Veitch).—Failed to germinate.

114. Mauve Queen (Barr).—Habit bushy, 20 inches; flower Hohenzollern, disc variable, $4\frac{3}{4}$ inches; light lavender violet (61 e).

115. New Giant Comet, bright rose (Barr).—Identical with No. 88.

116. New Giant Comet, Pink Beauty (Barr).—Habit erect, 20 inches; flower Comet, florets broad, curled; rose (71 b), fades quickly.

117. New Giant Comet, snow white (Barr).—Habit bushy, 16 inches ; flower Comet, $4\frac{1}{2}$ inches ; white.

118. New Giant Comet, soft, deep lavender (Barr).—Habit erect, 18 inches ; flower Comet, 5 inches ; deep lavender violet. Stock 83 per cent. true. A very decorative variety.

119. New Giant White Hercules (Barr), **XXX** August 28, 1914.—Habit bushy, 12–16 inches ; flower Comet, $4\frac{1}{2}$ inches ; centre well filled, white.

120. New Giant Hohenzollern, shell pink (Barr), **XXX** August 28, 1914.—Habit lax, 18 inches ; flower Hohenzollern, very flat, $5\frac{1}{4}$ inches ; white, with a faint blush.

121. New Late Branching, delicate pale yellow (Barr).—See 'Branching Aster' in introduction. Flower dull white, disc rather prominent.

122. New Late Branching, pale shell pink (Barr).—Habit of 121. Flower light rose pink (71 g).

123. New Late Branching, pale silvery lavender (Barr).—Habit of 121. Flower pale greyish violet (51" f).

124. New Late Branching, rich, deep, glowing rose (Barr).—Habit of 121. Flower deep mallow purple (67 a).

125. New Ostrich Feather, bright rose (Barr).—Identical with No. 103. Stock 92 per cent. true.

126. New Ostrich Feather, rich purple (Barr).—Failed.

127. New Ostrich Feather, snow white (Barr).—Habit bushy, 20 inches ; flower Comet, $4\frac{1}{2}$ inches ; poor centre, white. There are many better white Comet varieties. See 135.

128. New Gnome Aster, rose (Barr).—Habit bushy, 15 inches ; flower Victoria, loose, $3\frac{1}{4}$ inches ; pansy violet (63 i). Only three plants were raised.

129. New Yellow Sunlight (Barr), **XXX** August 28, 1914.—Habit lax, 24–26 inches ; flower incurved (light Pæony), with a rather poor centre ; Martius yellow (23 f). Stock, 75 per cent. true. A distinct advance in yellow asters.

130. Ostrich Plume, pale blue (Cartwright & Goodwin).—Habit bushy, loose, long red stems, 24 inches ; flower Comet, $4\frac{1}{2}$ inches ; petunia violet (65' h).

131. Ostrich Plume, crimson (Cartwright & Goodwin).—Habit bushy, loose stems, long red, 24 inches ; flower Comet, $4\frac{3}{4}$ inches ; deep rhodanine purple (67).

132. Ostrich Feather Snowball (Barr).—Habit bushy, 20 inches ; flower Hohenzollern, large disc, white. A poor, mean-looking flower.

133. Ostrich Plume, mixed (Sydenham).—A mixture, varying in type, height, habit, and colour.

134. Ostrich Plume, salmon pink (Cartwright & Goodwin).—Habit lax, 24 inches ; flower Comet, $4\frac{1}{4}$ inches ; Tyrian pink (69 c). An attractive variety.

135. Ostrich Plume, white (Cartwright & Goodwin).—Identical with 127.

136. Pink Pearl (Barr).—Habit erect, 15 inches ; flower Victoria, 3½ inches ; faintly shell pink.

137. Purple Queen (Barr).—Habit bushy, loose, 24–26 inches ; flower Pæony, 3½ inches ; raisin purple (65 l).

138. Queen of the Market, mixed (Barr).—Habit lax, 23 inches ; flower Victoria, loose, mixed colours.

139. Ruby (Heinemann), **XXX** August 28, 1914.—A variety of the Elegance type, 24 inches ; flowers single, 3½ inches, florets flat ; rich pomegranate purple (71). A few had rather paler flowers.

140. Sada Yakko, flesh pink (Barr).—Habit erect, 20 inches ; flower Chrysanthemum, florets straight, 3½ inches, blush.

141. Sada Yakko, new lilac (Barr).—See 140. Flowers pale lilac (63" g). Stock 83 per cent. true.

142. Scarlet King (Barr).—Habit Christmas-tree ; variable in height, but about 12 inches ; flower Victoria ; terminal, 3 inches ; lateral, 2 inches ; light amaranth purple (69 h).

143. Scarlet Queen (Barr).—Failed.

144. *sinensis* (Cartwright & Goodwin).—Habit lax, 24 inches ; flower single, 3 inches ; rays equal to the diameter of the disc, hyacinth violet (62 i). Colour variable and fading quickly.

145. The King (R. Veitch).—Habit erect, 20 inches ; flower Chrysanthemum ; good centre, 4 inches ; rose purple (67' d).

146. The Prince (R. Veitch), **A.M.** August 28, 1914.—Habit erect, 20 inches ; flower Pæony although florets are not much reflexed, 3½ inches ; white, upper part of florets flushed hortense violet. The flower had a silvery appearance, and was one of the most attractive varieties in the trial.

147. Toison d'Or (Hurst), **A.M.** August 28, 1914.—Habit bushy, 16 inches ; flower Victoria, 3½ inches ; faint sulphur-yellow (25 g). A very pleasing variety.

148. Triumph (Cartwright & Goodwin).—Habit bushy, 6–9 inches ; flower Pæony, 2½ inches ; deep amaranth purple (69). Ninety-two per cent. true.

149. Truffaut's Pæony-flowered Perfection (mixed) (Cartwright & Goodwin).—An erect-growing mixture. The flowers vary in type and colour.

150. Unicum white (Barr).—See description of 'Unicum' in introduction. Flowers white, 4 inches.

151. Unicum, crimson (Heinemann).—'Unicum' type. Flower poor, with short florets, 3½ inches ; amaranth pink (69 d).

152. Unicum, flesh-coloured (Barr).—'Unicum' type. Flower 4 inches ; light rose purple (67' d).

153. Unicum, flesh-coloured (Heinemann).—A mixture ; there is about 50 per cent. 'Unicum,' mainly blue and pink shades.

154. Unicum 'Malmaison' (Barr).—Identical with 153.

155. Unicum, pure white (Heinemann).—'Unicum' type. Flower good, 5 inches ; white.

156. Unicum, rose (Barr).—'Unicum' type. Flower, 5 inches; Tyrian pink (69 b).

157. Unicum, rose (Heinemann).—Identical with 150.

158. Veitch's Snowflake (R. Veitch).—Habit bushy, 18 inches; flower Hohenzollern, 5 inches; white. Stock 83 per cent. true.

159. Vick's Branching, mixed (Sydenham).—Habit lax, 24 inches; flower Victoria, rather early; disc variable; colours mixed.

160. Victoria, brown-red (Heinemann).—Failed.

161. Victoria, brown-violet (Heinemann).—Habit bushy, 16 inches; flower Victoria, 4 inches; purple (65'). Stock 87 per cent. true.

162. Victoria, Carmen (Heinemann).—Habit erect, 16 inches; flower Victoria, 3½ inches; rose colour (71 b). Stock 75 per cent. true.

163. Victoria, crimson (Cartwright & Goodwin).—Habit erect, compact, 18 inches, but a little variable; flower Victoria, very compact, 3½ inches; deep Tyrian pink (69 a).

164. Victoria, crimson (Carter).—Failed.

165. Victoria, crimson (Heinemann).—Failed.

166. Victoria, carmine rose (Heinemann), **XXX** August 28, 1914.—Habit erect, 19 inches; flower Victoria, 3½ inches; amaranth pink (69 d). A heavy, well-filled flower.

167. Victoria, crimson (Carter).—Habit bushy; one plant had rose purple flowers, the remainder Victoria, 3½ inches; florets white, with a central stripe of rhodamine purple. This stripe is wider on the outer than on the inner florets. Stock 90 per cent. true.

168. Victoria, dark blue (Cartwright & Goodwin).—Only two plants were raised, both with single flowers; one had hyacinth violet and the other purple ray florets. The disc was very large.

169. Victoria, dark blue (Heinemann), **XXX** August 28, 1914.—Habit erect, 15 inches; flower Victoria, 3½ inches; hyacinth violet (61 i). Stock 83 per cent. true.

170. Victoria, dark purple (Heinemann).—Habit erect, 16 inches; the stock is true but the Victoria flowers range through many shades of blue and purple.

171. Victoria, dark scarlet (Carter), **XXX** August 28, 1914.—Habit erect, 14 inches; flower Victoria, 3½ inches; pomegranate purple (71 i).

172. Victoria, indigo on white ground (Heinemann).—Habit bushy, 18 inches; flower Victoria, 3½ inches; amethyst violet, although rather variable in tone. The flowers have a silvery appearance.

173. Victoria, light blue (Carter).—Habit bushy but compact, 18 inches; flower Victoria, 3½ inches; light, soft, bluish violet (57'). Stock 90 per cent. true.

174. Victoria, light blue (Heinemann).—Habit bushy, 18 inches; flower Victoria, 4 inches; lavender violet (61' b). Stock 83 per cent. true.

175. Victoria, light blue and white (Carter).—Habit bushy, 18 inches; flower Victoria; florets lavender blue, with white margin.

176. Victoria, light violet (Carter).—Habit erect, 18–20 inches;

flower Victoria, $3\frac{1}{2}$ inches, deep hortense violet (61 a). Stock 92 per cent. true.

177. Victoria, Miss Roosevelt (Heinemann).—Habit erect, 20 inches; flower Chrysanthemum, $3\frac{1}{2}$ inches. When young the florets are pale yellow, and become cream with age.

178. Victoria, Peach Blossom (Heinemann).—Habit bushy, 12–18 inches; flower Victoria, $2\frac{1}{2}$ inches; good centre, pale Laelia pink (67" f).

179. Victoria, rose (Carter).—Habit lax, 18–20 inches; flower Victoria, $3\frac{1}{4}$ inches; amaranth pink (69 d).

180. Victoria, pink (Barr).—Habit loose, 12 inches; flower Chrysanthemum, $3\frac{1}{4}$ inches; hermosa pink (1 e). Stock 83 per cent. true.

181. Victoria, scarlet (Heinemann).—Habit erect, 18 inches; flower Victoria, 3 inches; light amaranth purple (69 h). Stock 83 per cent. true.

182. Victoria, sulphur yellow (Heinemann).—Habit erect, 20 inches; flower Victoria, $3\frac{1}{2}$ inches; dull white. Stock 67 per cent. true.

183. Victoria, vermilion, margin white (Heinemann).—Habit erect, variable in height; flower Victoria, 3 inches, deep Tyrian rose (69), with narrow white margin. Stock 92 per cent. true.

184. Victoria, violet purple (Heinemann).—Habit erect, 19 inches; flower Chrysanthemum, good centre, $3\frac{1}{2}$ inches; magenta purple (67' i).

185. Victoria, white (Carter).—Habit erect, 16 inches; flower Chrysanthemum, $3\frac{1}{2}$ inches, good centre, white.

186. Victoria, white (Cartwright & Goodwin).—This was a mixture, the plants varying in type and colour.

187. Victoria, white (Heinemann).—Failed.

188. Victoria, white, shading to rose (Carter).—Habit erect, 19 inches; flower semi-double, incurved florets, white, tinged and flecked with mallow purple. Stock 58 per cent. true.

189. Victoria, white, tinted rose (Heinemann), **XXX** August 28, 1914.—Habit erect, 20 inches; flower Victoria, white, just tinged with shell pink.

190. Vieux Rose (Barr).—Habit lax, 19 inches; flower Comet, $3\frac{1}{2}$ inches; colour is that stated by the name. Stock 75 per cent. true.

191. White Star (R. Veitch).—Failed.

192. White Wonder (Cartwright & Goodwin), **XXX** August 28, 1914.—Habit bushy, 12–18 inches; flower Victoria, $3\frac{1}{2}$ inches, white; centre good. A good white variety.

EARLY-FLOWERING CHRYSANTHEMUMS AT WISLEY, 1914.

REPORT BY C. C. TITCHMARSH, Trials Officer.

IN the spring of 1914 five hundred and eighty-four stocks of Early-Flowering Chrysanthemums were sent to Wisley for trial. Four hundred and three varieties were represented, of which 249 were early-flowering Japanese, 113 were single-flowered, 2 were pompons, and there were 39 varieties which failed to flower before the beginning of November.

The plants were placed in cold frames until the middle of May, when they were planted out in ground which had been trenched and manured during the previous winter. They were allowed to make natural growth, neither stopping nor disbudding being practised. The collection was examined by a Sub-Committee of the Floral Committee on two occasions.

The dry condition during the growing period reacted upon the plants in several directions. In general, both the plants and their flowers failed to attain their normal dimensions; the depth of colour in the pink and mauve-pink flowers was considerably increased; the time of flowering was not appreciably affected.

In this report the plants are grouped in twenty-six sections, necessarily arbitrary, under popular colour names. Sections I. to XV. comprise double varieties; XVI. pompon varieties; XVII. to XXV. single varieties, and XXVI. varieties which failed to flower. The varieties are arranged in alphabetical order in each section. The Roman numeral which follows each name in the preliminary list indicates the section in which the description of the variety will be found.

The technical colour name is given in the description, and is taken from "Colour Standards and Colour Nomenclature" (Ridgway), to which the index numbers and letters in parentheses refer. The determination of the tint of flowers which owe their colour to the presence of both red and yellow pigments presents the greatest difficulty; at the best it is only approximate. As the amount of red pigment produced is governed to some extent by external conditions, it is frequently difficult to decide in which class a plant must be placed: a "terra-cotta" may vary from "orange" to "bronze." The diameter given is that of a terminal flower; the measurement after the description of the plant is its height; the time, *e.g.* mid-September, is the period at which the plant reached its maximum flowering-point.

The Committee considered the following varieties to be the best in their sections :—

SECTION I —*Flowers* WHITE.

Caledonia	Market White
Pluie d'Argent	Roi des Blancs

SECTION II —*Flowers* BLUSH

Perle Châtillonnaise.

SECTION III —*Flowers* PINK.

Provence

SECTION IV —*Flowers* MAUVE-PINK

Fée Parisienne	Mabel Roberts.
Mme. Marie Masse	

SECTION V —*Flowers* SALMON-PINK.

George Bowness

SECTION VI.—*Flowers* PURPLE.

Jimmie	Lorraine.
R. Pemberton	

SECTION VII —*Flowers* PALE YELLOW.

Ethel	Gascoigne
J. Bannister	Martin Peed.
Stella	

SECTION VIII —*Flowers* YELLOW.

Carrie	Champ d'Or
Leslie	Miss B. Miller.

SECTION IX —*Flowers* ORANGE-YELLOW.

Harrie.

SECTION X —*Flowers* TERRA-COTTA

Brighton	Diana
F. Wilson	Minnie Carpenter
Nina Black	Polly
Tonkin	Wells' Scarlet.

SECTION XI —*Flowers* BRONZE.

A. Barnham	Bronze Goacher
Abercorn Beauty	

SECTION XII.—*Flowers* CHESTNUT

Crimson Polly	Evelyn.
Goacher's Terra-cotta	} Synonymous.
Mrs. J. Fielding	

SECTION XIII.—*Flowers* CHESTNUT-CRIMSON.

Almirante.

SECTION XIV.—*Flowers* CRIMSON.

Crimson Diana	Mme Drouard
Goacher's Crimson	Mrs. Sydenham.

SECTION XV.—*Flowers* ROSE-CRIMSON.

Ernest Baltet	Flambeau	} Synonymous.
	Fleuve Rouge	

SECTION XIX.—*Flowers* MAUVE-PINK (*Single*).

May.

SECTION XXIII.—*Flowers* TERRA-COTTA (*Single*).

Nellie Riding.

VARIETIES.

- | | |
|-------------------------------|--------------------------------|
| *1. Gladys Gray. XVI. | 57. Provence. III. |
| 2. Sally. IV. | 58. Savoie. II. |
| 3. Florence Gillham. XVII | 59. Bouquet Rose. IV. |
| 4. Dolly Reeves. IV. | 70. Bella McNeill. VIII. |
| 5. Verona. X. | 71. Crimson Polly. XII. |
| 6. Freedom. VI. | 72. Framfield Early White. I. |
| 7. Little Bob XVI. | 73. Early Beauty II. |
| 8. Châtillon. VII | 74. Caledonia. I. |
| 9. Minnie Carpenter. X | 75. Mrs. J. Fielding. XII. |
| 10. Brazier's Beauty XIX. | 76. Blue Boy. VI. |
| 11. Good Hope. XIX. | 77. Calliope IV. |
| 12. Rubis. VI | 78. Le Pactole XI |
| 13. Polly. X. | 79. Hermine. I |
| 14. Firebrand XXI | 80. Radiance XIV |
| 15. Formidable XX | 81. Harrie. IX. |
| 16. Surrey. XIX | 82. Bronze Goacher. XI. |
| 17. La Yonne. IV. | 83. Galatea. IV. |
| 18. Marie Corelli XXV | 84. Polly. X |
| 19. Roi des Blancs I | 85. Market White I. |
| 20. Provence III | 86. Goacher's Crimson. XIV. |
| 21. Francis X. | 87. Mme. Marie Masse. IV. |
| 22. Perle Châtillonnaise II | 88. Mrs. W. Sydenham. XIV. |
| 23. Harrie. IX | 89. Normandie. III |
| 24. Diana. X | 90. Crimson Diana XIV. |
| 25. Firefly X. | 91. Dolly Reeves. IV. |
| 26. Ethel Blades XIII. | 92. Maggie VIII |
| 27. Pride of Keston. VI | 93. Fée Parisienne IV. |
| 28. Market White. I. | 94. Ada V. |
| 29. Mignon IV. | 95. Carrie. VIII. |
| 30. Nellie King XXV. | 96. Cynthia IV |
| 31. Fée Parisienne IV. | 97. Lilie IV. |
| 32. Perle Rose III | 98. Mlle Renée Drouet. I |
| 33. Lillie IV | 99. Mignon IV |
| 34. Miss B Miller VIII | 100. Nina Black X |
| 35. Leslie VIII. | 101. Rosie X |
| 36. Mme. Marie Masse. IV | 102. Stella. VII |
| 37. Rosie X | 103. Sally IV. |
| 38. Kate Westlake XXI | 104. Mrs. Willis X. |
| 39. Champ d'Or. VIII | 105. Leslie. VIII. |
| 40. Goacher's Crimson XIV. | 106. Roi des Blancs. I. |
| 41. Red Diana. XIII. | 107. Kuroki. XI |
| 42. Patricia III | 108. Ethel. VII. |
| 43. La Somme IV | 109. Lizzie McNeill IX. |
| 44. Normandie III | 110. Elstob Yellow. VIII. |
| 45. Canada. XXIV | 111. Ernest Baltet XV. |
| 46. Le Pactole. XI | 112. Vésuve. XIII |
| 47. Roi des Jaunes VII | 113. Miss Balfour Melville XI. |
| 48. Eden. IV. | 114. Fleuve Rouge XV. |
| 49. Keith. IV. | 115. Wells' Primrose. VII. |
| 50. Gem of Merstham. XXI. | 116. Wells' Scarlet. X |
| 51. Kitty Riches. XVIII. | 117. Wells' Crimson. XIV. |
| 52. R. Pemberton. VI. | 118. Orange. X |
| 53. Betty Spark. III. | 119. Tuckwood Early. II |
| 54. Adonis. II | 120. Miss B. Miller. VIII |
| 55. Rotherfield Yellow. VIII. | 121. Patricia. III. |
| 56. F. Wilson. X. | 122. Touraine. III. |
| 57. Doris Palmer. XXI. | 123. White Countess. I. |
| 58. Pluie d'Argent. I. | 124. White Masse. I |
| 59. Artemis. I. | 125. Ralph Curtis. VII. |
| 60. Mrs. A. Beech. IX. | 126. La Tamise. II. |
| 61. Improved Masse. VI. | 127. Tonkin. X. |
| 62. George Bowness. V. | 128. Goacher's Pride. I. |
| 63. Hector. IV. | 129. Dorothy Humphrey. XXVI. |
| 64. Le Tage. XI. | 130. Emily. I. |
| 65. Abercorn Beauty. XI. | 131. Elenore. IV. |
| 66. Diana. X | 132. Diana. X. |

133. Mrs. Wheeler. X.
134. Le Danube. IV.
135. Dainty. IV.
136. Cranford White I.
137. Climax VIII.
138. Champ d'Or. VIII.
139. Cherry. XV.
140. Crimson Marie Masse. XII
141. Cranford Pink. III.
142. Claret. VI.
143. White Star. XVII.
144. Betty Surtees. III.
145. Venus. XX.
146. Cranford Yellow. VIII.
147. Silver Queen. XVII.
148. Surprise. XXVI.
149. The Downs. XX
150. Illumination. X.
151. Burgoyne. IV.
152. Châtillon. VII.
153. Brightness. XIV.
154. Yvette Richardson. XXVI.
155. Beacon. VI.
156. Wm. Scott. X.
157. Brilliant. X.
158. Caledonia. I.
159. Beauty. XI.
160. Carrie. VIII.
161. Freedom. VI.
162. Martin Peed. VII.
163. Brighton. X.
164. Framfield Early White I.
165. Almirante. XIII.
166. Bouquet Rose. IV.
167. Betty Spark. III.
168. Mychett White. I.
169. Belle Mauve. IV.
170. Champagne. XV.
171. Achievement. IV.
172. Bronze Queen. XXVI.
173. Border Beauty. XXVI.
174. Canite. XIII.
175. Agnes. XII
176. Alan. IV.
177. Ruby Queen. XX.
178. Bertie. X.
179. Cranfordia. VIII.
180. Harriette Cole. III.
181. Crimson Polly. XII.
182. Juliette. V.
183. Matthew Pollock. VI.
184. Dolores. X.
185. Terra-cotta. XXVI.
186. White Beauty. II.
187. Resolution. XXVI.
188. Ada. V.
189. Pride of Merstham. XX.
190. Royalty. XXIII.
191. Kitty Riches. XVIII.
192. Marjorie. XIX.
193. John Newton. XXIII.
194. Pink Beauty. XXVI.
195. Pathfinder. XXI.
196. Mrs. C. Curtis. XIV.
197. Pink Perfection. XVIII.
198. Starlight. XVII.
199. May. XIX.
200. Jamie XXVI.
201. Pyrethrum XX.
202. Rosy Morn. XXVI.
203. Philadelphia. XXVI.
204. Nellie Watson. XXVI.
205. Minnie. XXVI.
206. Nelson. XXV.
207. Mrs. Watson. XXIV.
208. Jupiter. XXVI.
209. Merstham Beauty. XXVI.
210. Good Hope. XIX.
211. Monarch. XIX.
212. Kingcup. XXV.
213. Madeline. XXIV.
214. Lewisham. XXI.
215. Eclipse. XX.
216. Glorious. XX.
217. Crimson Queen. XXI.
218. Canada XXIV.
219. Kent. XIX.
220. Chastity XXVI.
221. Eric. XXII.
222. Cecil. XIX.
223. Amber Gem. XXV.
224. Ambassador. XXIII.
225. Capella. XIX.
226. China. XXV.
227. Evelyn Neale. XXI.
228. Alice. XXVI.
229. White Masse. I.
230. White Countess. I.
231. White O. J. Quintus I.
232. Wells' Primrose. VII.
233. Vulcan. XIV.
234. Wells' Crimson. XIV.
235. Belle. XXII.
236. Brigadier. XXIII.
237. Cetus. XX.
238. Flame. X.
239. Mrs. Cragg VIII.
240. Buff Gem. X.
241. Miss B Miller. VIII.
242. Nina Williams. XIV.
243. Lillie. IV.
244. Flambeau. XV.
245. Nesta. II
246. Gascoigne. VII.
247. Firedragon XII.
248. Le Pactole. XI.
249. Edie Wright. XXVI.
250. Lorraine VI.
251. Lady Salt. X.
252. Mrs. W. Sydenham. XIV.
253. Princess. XXVI.
254. Howard H. Crane. X.
255. White Duchess. XXVI.
256. Mme. W. Hubert. III.
257. Doris Peto. I.
258. Holland's Yellow. XXVI.
259. Crimson Diana. XIV.
260. Mercedes VIII.
261. Rosie. X.
262. Provence. III.
263. Mrs. A. Thompson. VIII.
264. Queen of the Earlies. XXVI.
265. Miss F. Collier. I.
266. Badia Ferrer. VI.
267. Darling. III.
268. Canariense. VIII.
269. Mme. Desgranges. I.
270. Eileen. VI.

271. Firefly. X.
272. Minnie Carpenter. X.
273. Marvel. XV.
274. Goacher's Terra-cotta. XII.
275. Perfection. IX.
276. Perle Châtillonnaise. II.
277. Mrs. Tom White. XIV.
278. Diadem. VI.
279. Mrs. A. Cookson. VI.
280. Mme. Marie Masse. IV.
281. Mrs. Roots. I.
282. Polly. X.
283. Robbie Burns. V.
284. Miss Balfour Melville. XI.
285. Gertrude Hobbs. XIV.
286. Mignon. IV.
287. Nina Black. X.
288. Mrs. Bailey. VII.
289. October Gold. X.
290. La Yonne. IV.
291. Normandie. III.
292. Peile Rose. III.
293. Émile. II.
294. Pride of Hayes. IV.
295. Nellie Brown. VIII.
296. Fée Parisienne. IV.
297. Nellie Hemsley. III.
298. Le Tage. XI.
299. Le Rhin. X.
300. Mrs. J. Fielding. XII.
301. L'Aisne. VI.
302. L'Oise. IV.
303. L'Argenteuillaise. XIII.
304. Ralph Curtis. VII.
305. Gertie. X.
306. Leonard Peto. VIII.
307. Glory of Merstham. IV.
308. R. Pemberton. VI.
309. Roi des Blancs. I.
310. Picardie. IV.
311. Hector. IV.
312. L'Aube. II.
313. Leshe. VIII.
314. La Somme. IV.
315. Lena. X.
316. La Garonne. X.
317. La Touraine. III.
318. Fred. Bunstead. XIV.
319. La Tamise. II.
320. Jason. VII.
321. Jamie Brown. II.
322. Improved Masse. VI.
323. Satin Rose. XXVI.
324. Roi de Précoces. XIV.
325. Horace Martin. VIII.
326. Hilda Blick. VI.
327. Golden Glow. VIII.
328. Ryecroft Glory. IX.
329. J. Bannister. VII.
330. Gertie Gosney. XI.
331. Tapis de Neige. I.
332. Mrs. W. A. Hobbs. III.
333. Pride of Keston. VI.
334. Orange. X.
335. Rocket. X.
336. Holmes' White. I.
337. Ernest Baltet. XV.
338. Étoile d'Or. VIII.
339. Mrs. Burchfell. IV.
340. Goacher's Crimson. XIV.
341. O. J. Quintus. IV.
342. Ethel Blades. XIII.
343. Harrie. IX.
344. George Bowness. V.
345. C. Wermug. VIII.
346. Jack. X.
347. Joyce. IV.
348. Patricia. III.
349. Dora. XXIV.
350. Lily Ovenden. XVII.
351. Dean. XXI.
352. Majestic. XXIII.
353. Brightness. XXV.
354. Eric. XXII.
355. Chestnut. XXVI.
356. Clarice. XXVI.
357. Jessie Wallace. XXVI.
358. Dorando. XXIII.
359. Alice Smith. XIX.
360. Brazier's Beauty. XIX.
361. Robin. XXI.
362. Dominion. XXIV.
363. Minnie. XXVI.
364. Fortune's Favourite. XXIII.
365. Nellie King. XXV.
366. Donald. XXIII.
367. Kathleen. XXIII.
368. Gracie. XXII.
369. Dean Swift. XXV.
370. Mrs. Alec Thompson. XXIII.
371. Amber Beauty. XXV.
372. Canopus. XX.
373. Firebrand. XXI.
374. Canada. XXIV.
375. Spitfire. XXIII.
376. China. XXV.
377. Eva Grantham. XVII.
378. Mrs. C. Curtis. XIV.
379. Purple Prince. XX.
380. Evelyn Neale. XXI.
381. Masterpiece. XXI.
382. Robert Johnson. XIX.
383. Beauty. XXIII.
384. Olive. XIX.
385. Yallergal. XXV.
386. Good Hope. XIX.
387. Annie Piper. XXV.
388. Ruby. XXI.
389. Esther. XVIII.
390. Endsleigh. XVIII.
391. Albury. XXV.
392. A. W. Seabrook. XXII.
393. J. H. Runchman. XXIII.
394. A. J. Foster. XXII.
395. Greeneye. XVIII.
396. Dolly. XXV.
397. Hilda's Favourite. XX.
398. Roderick. XXVI.
399. Merstham Glory. XX.
400. Walton Bradbury. XVII.
401. The Carlton. XX.
402. Rockshaw. XXIII.
403. Miss Rose. XXVI.
404. Sunset. XXIV.
405. Holmthorpe. XXIII.
406. Nellie Riding. XXIII.
407. Prolific. XXII.
408. Surrey. XIX.

409. The Moon. XXV.
 410. Florence Gillham. XVII
 411. Monarch. XIX.
 412. W. A. Cull. XXII.
 413. The Dome. XXIV.
 414. Richard. XXVI
 415. The Downs. XX.
 416. Monarch. XIX.
 417. Little Nell. XVII.
 418. W. Newton. XXIII.
 419. Venerable. XXVI.
 420. Queen of the Earlies. XXVI
 421. White Quintus. I
 422. Alfred Fleurot. II.
 423. Wells' Primrose VII.
 424. Bouquet Rose. IV.
 425. L'Aube. II.
 426. Le Cygne. I.
 427. Bronze Goacher. XI
 428. Minnie Carpenter X.
 429. Tapis d'Or VIII
 430. Gustave Grunnewald III.
 431. Wells' Masse I
 432. Tonkin X.
 433. Perle Châtillonnaise II.
 434. Leshie. VIII.
 435. Mrs. W. A. Hobbs. III
 436. Cranford Pink. III.
 437. Mme. L. Forneau. IV.
 438. L'Ouse. IV.
 439. La Garonne. X.
 440. Flossball. I.
 441. La Yonne. IV.
 442. Crimson Diana XIV.
 443. Firefly. X.
 444. Roi des Blancs. I.
 445. H. H. Crane. X.
 446. Aquitaine. X.
 447. Touraine. III.
 448. Ethel Blades. XIII
 449. Dolly Reeves. IV.
 450. O. J. Quintus. IV
 451. James Bateman. IV.
 452. Milka. XXVI.
 453. Mrs. Bailey. VII.
 454. Blush Beauty. II.
 455. Polly. X.
 456. Gatton. XXVI
 457. Lillie. IV.
 458. Eden. IV.
 459. Francis. X.
 460. Betty Spark. III.
 461. Fée Orientale. II.
 462. Mme. Émile David. IV.
 463. Bordeaux. XVII.
 464. Mignon. IV.
 465. Framfield White. I.
 466. Mabel Roberts. IV.
 467. Crimson Marie Masse. XII.
 468. Étoile d'Or. VIII.
 469. Mme. Drouard. XIV.
 470. La Neva. I.
 471. Ethel. VII.
 472. Lorraine. VI.
 473. Provence. III.
 474. Nina Blick. X.
 475. Bouquet Blanc. I.
 476. Le Pactole. XI.
 477. La Somme. IV.
 478. Saumon Rouge. XXVI.
 479. Evelyn. XII.
 480. Normandie. III.
 481. Hermine. I.
 482. Harrie. IX.
 483. J. Bannister. VII.
 484. Bébé Blanc. I.
 485. Mrs. J. Fielding. XII.
 486. Le Danube. IV.
 487. Petite Jeanne. I.
 488. Mrs. Burchfell. IV.
 489. Hollicot White. XXVI
 490. Mme. Marques. II.
 491. Countess. I.
 492. Mme. Aug Nonin. III.
 493. Yellow Desgranges. XXVI.
 494. Petit Louis. IV.
 495. Champagne XV.
 496. Jimmie VI.
 497. Carrie. VIII.
 498. Early Beauty. II
 499. Hector. IV.
 500. Marocain. XXVI.
 501. Almirante. XIII
 502. Primevère. VII
 503. Esme Recd. I.
 504. A. Barnham. XI.
 505. Emily. I
 506. Auguste. I.
 507. Tottie. X.
 508. Crimson Grunnewald. XIII.
 509. Border Beauty. XXVI
 510. Le Rhin. X.
 511. Dorothy Ashley III
 512. Market White. I.
 513. Goacher's Terra-cotta. XII
 514. Crimson Polly. XII.
 515. Orion. IX
 516. Dolores. X.
 517. Mrs. W. Sydenham. XIV.
 518. Keith. IV.
 519. Mlle. Jean Labbe. IV.
 520. Le Tibre. X.
 522. Mrs. J. W. Scott. I.
 523. Rosie. X.
 524. Comtesse Foucher de Cariel. XI.
 525. Carrie. VIII.
 526. Improved Masse. VI.
 527. Mabel Roberts. IV.
 528. Henri Yvon. V.
 529. Champ d'Or. VIII.
 530. Ralph Curtis. VII.
 531. Horace Martin. VIII.
 532. Golden Glow. VIII.
 533. Cecil Wells. XI.
 534. Sally. IV.
 535. Helena. XII.
 536. Fée Parisienne. IV.
 537. Abercorn Beauty. XI.
 538. Pluie d'Argent. I.
 539. Patricia. III.
 540. Mrs. A. Thompson. VIII.
 541. Tapis d'Or. VIII.
 542. Mychett White. I.
 543. Verona. X.
 544. Mrs. E. V. Freeman. XIV.
 545. Belle Mauve. IV.
 546. Fedora. IV.
 547. Matthew Pollock. VI.

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| 548. L'Argenteuillaise. XIII. | 566. Miss Vida White. XVIII. |
| 549. Elstob Yellow. VIII. | 567. Kingcup. XXV. |
| 550. Mandarin. XII. | 568. Snowstorm. XXVI. |
| 551. Mme. Marie Masse IV. | 569. Dairie XXI. |
| 552. Claret. VI. | 570. Marie Corelli XXV. |
| 553. Mrs. Wingfield III. | 571. White City. XVII. |
| 554. Perle Rose. III. | 572. Pink Gem. XVIII. |
| 555. Wells' Crimson. XIV. | 573. Charming XIX. |
| 556. Golden Queen of the Earles XXVI. | 574. Carme Luxford. XXI. |
| 557. Chaldon XIV | 575. Dr Ingram XXI. |
| 558. Dr. A. Neige. VI | 576. Goldlace XXI |
| 559. Goacher's Crimson. XIV | 577. Gem of Merstham. XXI. |
| 560. Wells' Scarlet. X | 578. Kate Westlake XXI. |
| 561. Roi des Précoces. XIV | 579. Joan Carter. XXV. |
| 562. Cranford Yellow. VIII. | 580. The Navy XXIII. |
| 563. Elsa. I | 581. Ena. XIX. |
| 564. Miss Balfour Melville. XI | 582. Phyllis Cowley. XVII. |
| 565. Kitty Riches. XVIII | 583. Mary. XXIII. |
| | 584. Mrs Earle. XVII. |

A.M. = Award of Merit.

XXX = Highly Commended.

DECORATIVE VARIETIES.

SECTION I — *Flowers* WHITE.

59. Artemis (Dobbie).—Flower 3 inches in diameter, freely produced; florets long and drooping; plants bushy, $1\frac{1}{2}$ foot; early October.

506. Auguste (Wells).—Flower with yellow tinge in centre, $2\frac{1}{2}$ inches in diameter, florets long; plants stiff, $1\frac{1}{2}$ foot; early October.

484. Bébé Blanc (Wells).—Flower 4 inches in diameter, freely produced; florets long, broad, acute; plants very bushy, $1\frac{1}{4}$ foot; late October.

475. Bouquet Blanc (Wells).—Flower $2\frac{3}{4}$ inches in diameter, freely produced, plants bushy; late October.

74, 158. Caledonia (Dobbie, Wells), **A.M.** October 16, 1914.—Flower 3 inches in diameter; florets long, drooping, of good substance, younger creamy; plant stiff, $1\frac{1}{4}$ foot; late September.

136. Cranford White (Jones).—Flower 3 inches in diameter; florets broad and stiff; plants bushy, $1\frac{1}{2}$ foot; early October.

257. Doris Peto (Jones).—Flower 4 inches in diameter; florets long, drooping; plants bushy, $1\frac{1}{2}$ foot; early October.

563. Elsa (Wells).—Flower 5 inches in diameter, borne on long stalks; florets loose, broad, thin; plant stiff, $2\frac{1}{4}$ feet; mid-October.

505. Emily (Wells).—Flower $2\frac{1}{2}$ inches in diameter; plants sprawling, $1\frac{1}{4}$ foot; mid-September.

130. Emily (Jones).—This stock was 'Elenore.' See Section IV.

503. Esme Reed (Wells), **A.M.** October 15, 1907.—A white flowered sport from 'Mrs. Wingfield.' Sec. III.

440. Flossball (Wells).—Flower 4 inches in diameter; florets long, drooping, sometimes fimbriate; plant stiff, $2\frac{1}{2}$ feet. Apparently a form of 'Roi des Blancs.'

465. Framfield White (Wells).—See next.

72, 164. Framfield Early White (Dobbie, Wells), **A.M.** September 24, 1912.—Flower $3\frac{1}{2}$ inches in diameter; plants spreading, $1\frac{1}{2}$ foot; mid-October.

128. Goacher's Pride (Dobbie).—Flower $3\frac{1}{2}$ inches in diameter, freely produced; florets long; plant bushy, $1\frac{1}{2}$ foot; early September.

79, 481. Hermine (Dobbie; Wells).—Flower $3\frac{3}{4}$ inches in diameter; plants 2 feet; mid-October.

336. Holmes' White (Jones).—The plants made very poor growth, and produced a few thin flowers in early September.

470. La Neva (Wells).—Flower $3\frac{1}{2}$ inches in diameter; florets long; plants stiff; $1\frac{1}{2}$ foot; late October.

426. Le Cygne (Wells).—Flower 4 inches in diameter; florets long; plant stiff, $2\frac{1}{2}$ feet; early October. Much like 'Roi des Blancs,' but with a flatter flower.

28, 85, 512. Market White (Barr, Dobbie, Wells), **A.M.** September 29, 1910.—Flower 4 inches in diameter, freely produced; florets long; plant bushy, 2 feet; early October.

269. Mme. Desgranges (Jones).—Flower 3 inches in diameter, freely produced; plant bushy, 2 feet; mid-October.

98. Mlle. Renée Drouet (Dobbie).—Flower $4\frac{1}{2}$ inches in diameter, freely produced; florets long, acute, inner whorled; plant spreading; 2 feet; early October.

265. Miss F. Collier (Jones), **A.M.** October 11, 1910.—Flower 3 inches in diameter; florets long; plant bushy, $1\frac{1}{2}$ foot; late October.

522. Mrs. J. W. Scott (Wells).—Flower sometimes tinged purple, 4 inches in diameter; plant stiff, $2\frac{1}{2}$ feet; end October. A good flower, but too late.

281. Mrs. Roots (Jones), **A.M.** October 25, 1910.—Flower 3 inches in diameter; florets somewhat incurved; plant bushy, $1\frac{1}{2}$ foot; late October.

168. Mychett White (Jones), **A.M.** September 17, 1897.—Flower $3\frac{1}{2}$ inches in diameter, freely produced; florets long, of good substance; plant bushy, $1\frac{1}{2}$ foot; early September.

542. Mychett White (Wells).—Failed.

487. Petite Jeanne (Wells).—Flower 3 inches in diameter; florets drooping; plant stiff, $2\frac{1}{2}$ feet; late October.

58, 538. Pluie d'Argent (R. Veitch, Wells), **A.M.** October 16, 1914.—Flower $3\frac{1}{2}$ inches in diameter, produced in great profusion; florets broad, acute; plant very bushy, $1\frac{1}{4}$ foot; early September.

19, 106, 309, 444. Roi des Blancs (Barr, Dobbie, Jones, Wells), **A.M.** October 16, 1914.—Flower $4\frac{1}{4}$ inches in diameter; florets long, drooping, slightly quilled; plant stiff, $2\frac{1}{2}$ feet; early October.

331. Tapis de Neige (Jones), **A.M.** September 29, 1910.—Flower taking a slight pinkish flush with age, 4 inches in diameter, produced very freely; plant bushy, 2 feet; early October.

123, 230, 491. White Countess (Dobbie, Jones, Wells).—Flower $3\frac{1}{2}$ inches in diameter, very freely produced, florets broad, acute; plant bushy, $2\frac{1}{2}$ feet; mid-October.

124, 229. White Masse (Dobbie, Jones).—A creamy-white sport from 'Mme. Marie Masse.' Sec. IV.

231, 421. White Quintus (Jones, Wells).—A white-flowered sport from O. J. Quintus. Sec. IV.

SECTION II.—*Flowers* BLUSH.

54. Adonis (Barr).—Flower creamy white, with a light flush of mallow-purple (67 d), $3\frac{1}{2}$ inches in diameter; plant stiff, $1\frac{1}{2}$ foot; early September.

422. Alfred Fleurot (Wells).—Flower white, shaded light mallow-purple (67 d), 3 inches in diameter, very freely produced; plant stiff, 2 feet; early October.

454. Blush Beauty (Wells).—Flower white, with a passing shade of rose pink (71 f), $2\frac{1}{4}$ inches in diameter; plant bushy, $1\frac{1}{2}$ foot; early September.

73, 498. Early Beauty (Dobbie, Wells).—Flower white, becoming flushed with mallow-pink (67 e), 3 inches in diameter, very freely produced; florets short and the plants bushy, 2 feet; end August.

293. Émile (Jones).—Flower white, with a faint shading of amaranth-pink (69 i), $3\frac{1}{2}$ inches in diameter; florets long; plant bushy, 2 feet; mid-September.

461. Fée Orientale (Wells).—Flower cream colour (19 f), shaded with light mallow-purple (67 c) at the tips of the long, drooping florets, 7 inches in diameter, whorled at centre; plant stiff, 2 feet; mid-October.

321. Jamie Brown (Jones).—Flower white, lightly streaked with Tyrian pink (69 b), $3\frac{1}{2}$ inches in diameter; plant bushy, 2 feet; mid-October.

126, 319. La Tamise (Dobbie, Jones).—Flower white, with a passing pink flush, 3 inches in diameter; florets loose; plant irregular, 2 feet; early October.

312, 425. L'Aube (Jones, Wells).—Flower white, suffused with mallow-purple (67 c), the intensity of the pigmentation varying in different plants, $3\frac{1}{2}$ inches in diameter; plant spreading to a flat bush, $1\frac{1}{4}$ foot; late September.

490. Mme. Marques (Wells).—Flower creamy, passing to white, tinged with amaranth-pink (69 f), round, 3 inches in diameter, produced very freely; plant bushy, $1\frac{1}{2}$ foot; mid-October.

245. Nesta (Jones).—Flower white, more or less flushed with rhodamine purple (67), 3 inches in diameter, scanty; plant loose, 2 feet; late September.

22, 276, 433. Perle Châtillonnaise (Barr, Jones, Wells), **A.M.** September 29, 1910.—Flower creamy white, shaded with mallow-purple (67 c); 4 inches in diameter, hemispherical, freely produced; florets slightly quilled; plant stiff, 2 feet; mid-September.

68. Savoie (Dobbie).—Flower white, with a passing pink flush, $2\frac{1}{2}$ inches in diameter; plant stiff, $2\frac{1}{2}$ feet; mid-October.

119. Tuckswood Early (Dobbie).—Flower white, becoming flushed with mallow-pink (67 e) as it ages, $3\frac{1}{2}$ inches in diameter, very freely produced; plant bushy, 1 foot; late August.

186. White Beauty (Jones).—Flower white, with a slight pink flush on the younger florets, $3\frac{1}{4}$ inches in diameter; florets long; plant spreading to a flat bush, $1\frac{1}{2}$ foot; mid-October.

431. Wells' Masse (Wells), **A.M.** September 12, 1905.—A white sport from 'Mme. Marie Masse,' just flushed with Tyrian pink (69 b).

SECTION III.—*Flowers PINK.*

53, 167, 460. Betty Spark (Barr, Dobbie, Wells), **A.M.** September 27, 1910.—Flower amaranth-pink (69 f), $3\frac{1}{4}$ inches in diameter; plant stiff, 2 feet; early October.

144. Betty Surtees (Jones).—Flower amaranth-pink (69 d), $3\frac{1}{2}$ inches in diameter; plant compact, bushy, $1\frac{1}{4}$ foot; late September.

141, 436. Cranford Pink (Jones, Wells).—Flower mallow-pink (67 f), 4 inches in diameter; florets broad; plant stiff, branching; late October.

267. Darling (Jones).—Flower bright strawberry-pink (5 b) on a faint yellow ground, $3\frac{1}{2}$ inches in diameter, freely produced; plant very bushy, 2 feet; early October.

511. Dorothy Ashley (Wells).—Flower amaranth-pink (69 d), 4 inches in diameter, well shaped; florets slightly quilled, long; plant compact, $1\frac{1}{2}$ foot; late September.

430. Gustave Grunnerwald (Wells).—Flower amaranth-pink (69 d), 4 inches in diameter; florets semi-quilled; plant spreading, $1\frac{1}{4}$ foot; mid-September.

180. Harriette Cole (Jones).—Flower pale amaranth-pink (69 f), 3 inches in diameter, very freely produced; florets long; plant stiff, 3 feet; mid-October.

492. Mme. Aug. Nonin (Wells).—Flower amaranth-pink (69 e), $3\frac{1}{2}$ inches in diameter, freely produced; plant very bushy, 2 feet; mid-September.

256. Mme. W. Hubert (Jones).—Flower amaranth-pink (69 d), 3 inches in diameter, scanty; florets long; plant stiff, $2\frac{3}{4}$ feet; mid-October.

332, 435. Mrs. W. A. Hobbs (Jones, Wells).—Flower pale amaranth pink (69 f), $3\frac{1}{4}$ inches in diameter, very freely produced; florets straight, rather long; plants bushy, $1\frac{1}{2}$ foot; mid-September.

553. Mrs. Wingfield (Wells), **A.M.** October 12, 1897.—Flower pale amaranth-pink (69 f), 3 inches in diameter, very freely produced; plant spreading to a flat bush, 1 foot; mid-October.

297. Nellie Hemsley (Jones).—Flower amaranth-pink (69 d), $2\frac{1}{2}$ inches in diameter; florets straight; plant bushy, 2 feet; late September.

44, 89, 291, 480. Normandie (Barr, Dobbie, Jones, Wells).—Flower pale amaranth-pink (69 e), $3\frac{1}{2}$ inches in diameter, freely produced; plant spreading, $1\frac{3}{4}$ foot; mid-September.

42, 121, 348, 539. Patricia (Barr, Dobbie, Jones, Wells).—Flower amaranth-pink (69 d), $4\frac{1}{2}$ inches in diameter; florets long; plant stiff, 2 feet; early October.

32, 292, 554. Perle Rose (Barr, Jones, Wells), A.M. October 18, 1904.—Flowers amaranth-pink (69 d), 3 inches in diameter freely produced; florets broad; plant stiff, 2 feet; late September.

20, 67, 262, 473. Provence (Barr, Dobbie, Jones, Wells), A.M. September 29, 1910.—Flower pale amaranth-pink (69 e), 3 inches in diameter, freely produced; plant stiff, bushy, 2 feet, early October.

122, 317. Touraine (Dobbie, Jones).—Flower pale amaranth-pink (69 f), 3 inches in diameter; florets straight; plant bushy, $1\frac{1}{2}$ foot; early September.

447. Touraine (Wells).—Stock mixed.

SECTION IV.—*Flowers* MAUVE-PINK.

171. Achievement (Jones).—Flower a pale shade of aster purple (67 i), $3\frac{1}{2}$ inches in diameter, freely produced; florets white on reverse; plant of lax growth, $2\frac{1}{4}$ feet; mid-October.

176. Alan (Jones).—Flower mallow-pink (67 f), 3 inches in diameter, scanty; florets incurved; plant bushy, 3 feet; early October.

169, 545. Belle Mauve (Jones, Wells).—Flower deep mallow-pink (67 e), $3\frac{1}{2}$ inches in diameter, very freely produced; florets broad; plant very bushy, $2\frac{1}{4}$ feet; mid-October.

69, 166, 424. Bouquet Rose (Dobbie, Jones, Wells), A.M. October 25, 1910.—Flower rhodamine purple (69), $3\frac{1}{2}$ inches in diameter; florets long; plant stiff, bushy; mid-October.

151. Burgoyne (Jones).—Flower white, shaded mallow-purple (67 b), $3\frac{1}{2}$ inches in diameter, rough; plant bushy, $2\frac{1}{4}$ feet; late October.

77. Calliope (Dobbie).—Flower Tyrian rose (69) to mallow-purple (67 c), 3 inches in diameter; plant stems much bent, forming a weak bush; late September.

96. Cynthia (Dobbie).—Flower mallow-purple (67 d), paler at tips of florets, centre neutral brown, 4 inches in diameter; florets long, broad, drooping; plant bushy, 2 feet; early October.

135. Dainty (Jones).—Flower white, with a deep flush of rhodamine purple (67), $3\frac{1}{2}$ inches in diameter, freely produced; plant compact, $1\frac{1}{2}$ foot; early October.

4, 91, 449. Dolly Reeves (Barr, Dobbie, Wells).—Flower light shade of mallow-purple (67 b), growing paler as the flower ages, 3 inches in diameter, very freely produced; plant very bushy, $1\frac{1}{2}$ foot; early September.

48, 458. Eden (Barr, Wells), A.M. October 25, 1910.—Flower pale magenta (67"), 3 inches in diameter, freely produced; florets long; plant bushy, $2\frac{1}{4}$ feet; mid-October.

131. Elenore (Jones).—Flower mallow-purple (67 b), $3\frac{1}{2}$ inches in diameter; florets long, inclined to be quilled; plant a compact bush, $1\frac{1}{2}$ foot; mid-September.

546. *Fedora* (Wells).—Flower Tyrian pink (69 d), 4 inches in diameter, freely produced; florets somewhat quilled; plant bushy 1½ foot; late October.

31, 93, 296, 536. *Fée Parisienne* (Barr, Dobbie, Jones, Wells), **A.M.** September 25, 1914.—Flower mallow-purple (67 b), 3½ inches in diameter, freely produced; florets long and drooping, whorled in the centre; plant stiff, 3 feet; mid-September. A very distinct variety.

83. *Galatea* (Dobbie).—Flower mallow-pink (69 f), 3 inches in diameter, flat, scanty; florets quilled, deeper colour at the base; plant poor, 1½ foot; late September.

307. *Glory of Merstham* (Jones).—Flower mallow-pink (67 f), 2½ inches in diameter; florets long, with a chestnut flush at the tip; plant bushy, 1¾ foot; late October.

63, 311, 499. *Hector* (Dobbie, Jones, Wells).—Flower varying from mallow-purple to mallow-pink (67 b-f), 5 inches in diameter, scanty; florets long, broad, and drooping; plant erect, with long, stiff stems, 2 feet; mid-October.

451. *James Bateman* (Wells).—Flower light mallow-purple (67 d), 4 inches in diameter; florets long; plant very poor, diseased; early October.

347. *Joyce* (Jones).—Flower mallow-purple (67 c), 3½ inches in diameter; plant bushy, 1½ foot; early October.

49, 518. *Keith* (Barr, Wells).—Flower white, with a heavy shading of mallow-purple (67 b), 3 inches in diameter, hemispherical, very freely produced; florets long, quilled; plant bushy, 1 foot; mid-September.

43, 314, 477. *La Somme* (Barr, Jones, Wells).—Flower mallow pink (67 f), 3½ inches in diameter, very freely produced; florets long; plant stiff, 2 feet; early October.

17, 290, 441. *La Yonne* (Barr, Jones, Wells).—Flowers mallow pink (67 f), 3½ inches in diameter, freely produced; florets long, deeper colour at the base; plant bushy, 2 feet; mid-September.

134, 486. *Le Danube* (Jones, Wells).—Flower mallow-purple (67 c), 3½ inches in diameter; florets long, drooping; plant stiff, 2½ feet; mid-October.

33, 97, 243, 457. *Lillie* (Barr, Dobbie, Jones, Wells).—Flower mallow-purple (67 b), 3 inches in diameter; plant bushy, 1½ foot; late September.

302. *L'Oise* (Jones).—Flower Tyrian pink (69 b), 3½ inches in diameter; plant stiff, 2 feet; late September.

438. *L'Ouse* (Wells).—See *L'Oise*, the correct name.

466, 527. *Mabel Roberts* (Wells), **A.M.** October 16, 1914.—Flower Tyrian pink (69 b), 3 inches in diameter, freely produced; florets long; plant stiff, 2 feet; mid-October.

462. *Mme. Émile David* (Wells).—Flower rhodamine purple (67), 3 inches in diameter; florets slightly incurved; plant bushy, 2½ feet; early October.

437. Mme. L. Forneau (Wells).—Flower light rhodamine purple, (67 a), 4 inches in diameter, freely produced ; plant spreading, $1\frac{1}{4}$ foot ; early September.

36, 87, 280, 551. Mmc. Marie Masse (Barr, Dobbie, Jones, Wells), **A.M.** August 9, 1898.—Flower Tyrian pink (69 b), varying in tint, 4 inches in diameter, very freely produced ; florets broad ; plant spreading, $1\frac{1}{2}$ foot ; late August.

519. Mlle. Jeanne Labbe (Wells).—Flower deep mallow-purple (67 b), 3 inches in diameter, freely produced ; plant spreading, 1 foot ; early September.

29, 99, 286, 464. Mignon (Barr, Dobbie, Jones, Wells).—Flower mallow-pink (67 f), $3\frac{1}{2}$ inches in diameter, very freely produced ; peduncles short ; florets long, drooping ; plant stiff, $2\frac{1}{2}$ feet ; late September.

339, 488. Mrs. Burchfell (Jones, Wells).—Flower mallow-purple (67 b), with the tips of the florets just tipped with yellow, $3\frac{1}{2}$ inches in diameter, freely produced ; plant large, bushy, $2\frac{1}{4}$ feet ; mid-October.

341, 450. O. J. Quintus (Jones, Wells).—Flower light mallow-purple (67 d), with a white stripe at the middle of each floret, 3 inches in diameter ; plant bushy, $1\frac{3}{4}$ foot ; mid-October.

494. Petit Louis (Wells).—Flower mallow-purple (67 b), 4 inches in diameter ; florets long ; plant stiff, $2\frac{1}{4}$ feet ; late September.

310. Picardie (Jones).—Flower mallow-purple (67 b), $3\frac{1}{2}$ inches in diameter ; florets long ; plant bushy, $2\frac{1}{2}$ feet ; mid-October.

294. Pride of Hayes (Jones).—The plants made poor growth, and the flowers were quite out of character.

2, 103, 534. Sally (Barr, Dobbie, Wells).—Flower light rosolane-purple (69 c), 3 inches in diameter, hemispherical ; florets quilled ; plant bushy, 2 feet ; early October.

SECTION V.—*Flowers* SALMON-PINK.

94, 188. Ada (Dobbie, Jones).—Flower mallow pink (67 f), shaded with chestnut yellow, 3 inches in diameter ; florets long ; plant spreading, $1\frac{1}{2}$ foot ; late September.

62, 344. George Bowness (Dobbie, Jones), **A.M.** September 12, 1905.—A sport from 'Mme. Marie Masse' (Sec. IV.). The flower is picric yellow (23 d), more or less flushed with rose. Well described as "crushed strawberry."

528. Henri Yvon (Wells).—A sport from 'Gustave Grunnerwald' (Sec. III.). The flower is very pale lemon-yellow (21 c), with a flush of pale Tyrian rose (69).

182. Juliette (Jones).—Flower dull, pale, rose red (71), upon very pale yellow, 3 inches in diameter ; florets long ; plant bushy, 2 feet late October.

283. Robbie Burns (Jones).—A sport from 'Mme. Marie Masse' (Sec. IV.). The flower is faintly yellow, with a pale wash of rhodamine purple (67 h).

SECTION VI.—*Flowers* PURPLE.

266. Badia Ferrer (Jones).—Flower pomegranate-purple (71 i), 3 inches in diameter; florets long, slightly quilled, pale dull yellow reverse; plant bushy, 1½ foot; mid-September.

155. Beacon (Jones).—Flower bright amaranth-purple (69 i), 3 inches in diameter, irregular in contour; plant bushy, 1½ foot; late September.

76. Blue Boy (Dobbie).—Flower light amaranth-purple (67 i), shaded with deep orange at the tips of the incurved florets, 3 inches in diameter; plant stiff, 2½ feet; mid-September.

142, 552. Claret (Jones; Wells).—Flower rhodamine purple (67), 2½ inches in diameter, very freely produced; plant spreading 1½ foot; mid-September.

278. Diadem (Jones).—Flower pomegranate purple (71 i), 3 inches in diameter, scanty; florets incurved, dull yellow reverse; plant spreading, 2 feet; late September.

558. Dr. A. Neige (Wells).—Flower a light tint of amaranth-purple (69), 3 inches in diameter; florets broad; plant bushy, 1½ foot; early October.

270. Eileen (Jones).—Flower amaranth-purple (69 i), 2½ inches in diameter, scanty; plant stiff, 3 feet; late October.

6, 161. Freedom (Barr, Jones), A.M. October 25, 1910.—Flower magenta (67'), 3 inches in diameter; florets long; plant bushy, irregular, 1½ foot; late September.

326. Hilda Blick (Jones), A.M. October 25, 1910.—Flower dull rhodamine purple (76), 3½ inches in diameter; florets long, white reverse; plant spreading, 2 feet; early October.

61, 322, 526. Improved Masse (Dobbie, Jones, Wells).—All three stocks made very little growth, producing but a few malformed amaranth-purple (69 i) flowers.

496. Jimmie (Wells), A.M. September 25, 1914.—Flower rich, deep amaranth-purple (69 i), 4½ inches in diameter; florets long, broad, curling; plant bushy, 2 feet; mid-October.

301. L'Aisne (Jones).—Flower amaranth-purple (69 i), 3½ inches in diameter; florets long, curling; plant bushy, 2 feet; mid-October.

472. Lorraine (Wells), A.M. September 25, 1914.—Flower deep amaranth-purple (69 i), 3 inches in diameter, freely produced; plant bushy, 1½ foot; mid-September.

250. Lorraine (Jones).—Stock mixed.

183, 547. Matthew Pollock (Jones, Wells).—A sport from 'Gustave Grunnerwald' (Sec. III.) with flowers of a light shade of asterp urple (67 h) and a white reverse to the florets.

279. Mrs. A. Cookson (Jones).—Flower rosolane purple (69'), 2½ inches in diameter; florets a little incurved, white reverse; plant bushy, 1½ foot; mid-October.

27, 333. Pride of Keston (Barr, Jones).—Flower amaranth-purple (69 i), 3½ inches in diameter; florets long; plant bushy, 2 feet; mid-October.

52, 308. R. Pemberton (Barr, Jones), **A.M.** October 16, 1914.—Flower bright amaranth-purple (69 i), 4 inches in diameter, very freely produced; florets long; plant bushy, 2½ feet; early October.

12. Rubis (Barr).—Flower amaranth-purple (69 i), 2½ inches in diameter, very freely produced; plant bushy, 1½ foot; late September.

SECTION VII.—*Flowers* PALE YELLOW.

8. Châtillon (Barr).—Flower citron yellow (23') with a slight reddish tinge when young, 3 inches in diameter; florets long, semi-quilled; plant stiff, 2 feet; late September.

152. Châtillon (Jones).—Stock mixed.

108. 471. Ethel (Dobbie, Wells), **A.M.** September 11, 1906.—Flower baryta-yellow (21 f); florets with a slight purplish tinge at the base. Said to be a sport from 'Robbie Burns' (Sec. V.).

246. Gascoigne (Jones), **XXX** September 25, 1914.—Flower picric yellow (23 d), 3¼ inches in diameter, freely produced on short stalks; plant very bushy, 2 feet; mid-September.

320. Jason (Jones).—Stock mixed.

329, 483. J. Bannister (Jones, Wells), **A.M.** September 25, 1914.—Flower buff yellow (19 d), passing to pale lemon-yellow, 4 inches in diameter, freely produced; florets long, quilled, and drooping; plant stiff, 2½ feet; mid-September.

162. Martin Peed (Jones), **A.M.** September 25, 1914.—A variety almost identical with 'J. Bannister' but the flowers are a paler and more pleasing yellow.

288, 453. Mrs. Bailey (Jones, Wells).—A sport from 'Mme. Marie Masse' (Sec. IV). The flower is at first faint picric yellow (23 d), passing to cream as it ages.

502. Primevère (Wells).—Flower pale lemon-yellow (23) when young, becoming cream when fully expanded, 3½ inches in diameter; florets long, drooping; plant forming a good, round-headed bush, 1½ foot; late October.

125, 304, 530. Ralph Curtis (Dobbie, Jones, Wells).—A sport from 'Mme. Marie Masse' (Sec. IV.). The flower is faint primrose yellow (23" d).

47. Roi des Jaunes (Barr).—Flower lemon-yellow (23), 4 inches in diameter, scantily produced; florets long; plant bushy, 2 feet.

102. Stella (Dobbie), **A.M.** October 16, 1914.—Flower white, with an extensive flush of lemon-yellow (23), 4½ inches in diameter, very freely produced; florets thin; plant spreading, 2 feet.

115, 232, 423. Wells' Primrose (Dobbie, Jones, Wells).—Flower pale primrose-yellow (23" d), 4½ inches in diameter; florets long, those in centre whorled; plant stiff, 2 feet; mid-September.

SECTION VIII.—*Flowers* YELLOW.

70. Bella McNeill (Dobbie).—Flower lemon-yellow (23), with a slight flush of pink at the base of each rather thin, long floret, 4 inches in diameter; plant stiff and bushy, 1½ foot; early September.

268. Canariense (Jones).—Flower bright lemon-chrome (21), $3\frac{1}{4}$ inches in diameter; plant forming a loose bush, 2 feet; foliage pale green; early October.

95, 497, 525. Carrie (Dobbie, Wells, Wells), **A.M.** September 23, 1902.—Flower deep lemon-yellow (23), $3\frac{1}{2}$ inches in diameter, very freely produced, unaffected by frost; plant bushy, 2 feet; mid-September.

160. Carrie (Jones).—Stock mixed.

39, 138, 529. Champ d'Or (Barr, Jones, Wells), **A.M.** September 25, 1914.—Flower lemon-chrome (21), $3\frac{1}{4}$ inches in diameter, very freely produced; plant spreading, forming a flat-topped bush, $1\frac{1}{2}$ foot; early October.

137. Climax (Jones).—Flower dull lemon-yellow (23), $2\frac{1}{2}$ inches in diameter; florets short; plant spreading, forming a flat-topped bush; mid-October.

179. Cranfordia (Jones), **A.M.** October 11, 1910.—Flower bright lemon-yellow (23), 4 inches in diameter, freely produced; florets long; plant stiff, $2\frac{1}{2}$ feet; early October.

146, 562. Cranford Yellow (Jones, Wells), **A.M.** October 10, 1911.—Flower bright lemon-chrome (21), $3\frac{1}{2}$ inches in diameter, freely produced; florets broad, acute; plant bushy, $1\frac{1}{4}$ foot; early October.

345. C. Wernig (Jones).—Flower bright lemon-yellow (23), 3 inches in diameter, freely produced; florets long; plant bushy, $1\frac{3}{4}$ foot; mid-October.

110, 549. Elstob Yellow (Dobbie, Wells).—Flower lemon-yellow (23), 3 inches in diameter, almost spherical, very freely produced; plant spreading, 1 foot; mid-September.

338, 468. Étoile d'Or (Jones, Wells).—Flower deep lemon-chrome (21), 4 inches in diameter; florets long, centre whorled; plant bushy, 2 feet; late October.

327, 532. Golden Glow (Jones, Wells).—Flower deep lemon-yellow (23), $3\frac{3}{4}$ inches in diameter; florets somewhat incurved; plant stiff, $2\frac{1}{2}$ feet; early October.

325, 531. Horace Martin (Jones, Wells), **A.M.** September 24, 1901.—The form and stature of 'Mme. Marie Masse' and said to be a sport from 'Crimson Masse.' Flower lemon-yellow (23).

306. Leonard Peto (Jones).—Flower deep lemon-yellow (23), but out of character, as the plants grew very badly.

35, 105, 313, 434. Leslie (Barr, Dobbie, Jones, Wells), **A.M.** September 14, 1909.—Flower lemon-yellow (23), 3 inches in diameter; florets rather thin, acute; plant spreading, $1\frac{1}{2}$ foot; late September.

92. Maggie (Dobbie).—Flowers lemon-yellow (23), $2\frac{1}{2}$ inches in diameter, peduncles short; plant bushy, $1\frac{1}{2}$ foot; leaves curiously irregular; early October.

260. Mercedes (Jones).—Flower deep lemon-chrome, $3\frac{1}{2}$ inches in diameter; plant bushy, $2\frac{1}{4}$ feet; mid-October.

239. Mrs. Cragg (Jones).—Flower antimony-yellow (17' b), $3\frac{1}{2}$ inches

in diameter; florets very long and quite straight; plant bushy, $1\frac{1}{2}$ foot mid-October.

34, 120, 241. Miss B. Miller (Barr, Dobbie, Jones), **XXX** October 16, 1914.—Flower lemon-chrome (21), $2\frac{1}{4}$ inches in diameter, freely produced; plant spreading, $2\frac{1}{2}$ feet; early October.

263, 540. Mrs. A. Thomson (Jones, Wells), **A.M.** September 29, 1910.—Flower deep lemon-chrome (21), $2\frac{3}{4}$ inches in diameter; florets short; plant very spreading, 1 foot; mid-October. None of the plants of this variety made good growth.

295. Nellie Brown (Jones), **A.M.** October 25, 1898.—Flower deep lemon-chrome (21), $2\frac{1}{2}$ inches in diameter, freely produced; florets broad; plant bushy, good rounded head, 2 feet; mid-October. Sport from 'Ryecroft Glory' (Sec. IX.).

55. Rotherfield Yellow (Yates).—Flower lemon-chrome (21), $3\frac{1}{2}$ inches in diameter; florets long; plant bushy, $2\frac{1}{2}$ feet; mid-October.

541. Tapis d'Or (Wells).—Flower deep lemon-yellow (23), 3 inches in diameter, very freely produced; florets long; plant stiff, a good round-headed bush, $1\frac{1}{2}$ foot; mid-October.

429. Tapis d'Or (Wells).—White-flowered; wrongly named, probably 'Tapis de Neige' (Sec. I.).

SECTION IX.—*Flowers* ORANGE-YELLOW.

23, 81, 343, 482. Harrie (Barr, Dobbie, Jones, Wells), **A.M.** September 12, 1905.—Flower lemon-chrome (21), suffused with a light scarlet wash, which fades as the flower ages, $3\frac{1}{4}$ inches in diameter, freely produced; florets broad; plant bushy, $1\frac{1}{2}$ foot; late September.

109. Lizzie McNeill (Dobbie).—Flower deep lemon-chrome (21), heavily shaded with reddish crimson, 4 inches in diameter, freely produced; plant bushy, 2 feet; late October.

60. Mrs. A. Beech (Dobbie).—Flower lemon-chrome (21), with a slight shading of chestnut-red, 3 inches in diameter; plant stiff, $2\frac{1}{2}$ feet; mid-October.

515. Orion (Wells).—Flower light cadmium-yellow (19), tinged with chestnut-red; florets acute; plant bushy, $1\frac{3}{4}$ foot; early September.

275. Perfection (Jones).—Flower deep lemon-yellow (23) with a slight crimson-scarlet flush, 3 inches in diameter, hemispherical; plant loose, spreading, $1\frac{1}{4}$ foot; mid-September.

328. Ryecroft Glory (Jones), **A.M.** October 24, 1893.—Flower deep lemon-chrome (21), lightly shaded chestnut-red, 3 inches in diameter; florets long; plant bushy, 2 feet; mid-October.

SECTION X.—*Flowers* TERRA-COTTA.

446. Aquitaine (Wells).—Flower carmine-red (21) on a dull lemon-yellow (23) ground, $3\frac{1}{2}$ inches in diameter; florets long; plant bushy, $2\frac{1}{4}$ feet; early October.

178. Bertie (Jones).—Flower dull scarlet (5) on a pale dull chrome-yellow ground, 3 inches in diameter; florets long, scantily produced; plant spreading, very poor, $1\frac{1}{2}$ foot; mid-October.

163. Brighton (Jones), **XXX** September 25, 1914.—Flower orange-terra-cotta, $3\frac{1}{2}$ inches in diameter, very freely produced; florets long, lemon-chrome (21), washed pale scarlet (5) on the upper surface; plant bushy, 2 feet; early October.

157. Brilliant (Jones).—Flower English red (7 i), with lemon-chrome (21) reverse to the florets, 4 inches in diameter; stalks short; plant bushy, 2 feet; late September.

240. Buff Gem (Jones).—Flower orange (15), 3 inches in diameter, freely produced; plant bushy, 2 feet; late October.

24. 66, 132. Diana (Barr, Dobbie, Jones), **A.M.** September 29, 1910.—Flower deep lemon-chrome (21), shaded with chestnut-red, 3 inches in diameter, freely produced; florets incurved; plant bushy, $1\frac{1}{2}$ foot; mid-September.

184, 516. Dolores (Jones, Wells).—Flower pale scarlet-red (4 h) on light dull yellow, $3\frac{1}{2}$ inches in diameter; plant bushy, $2\frac{1}{2}$ feet; mid-October.

25, 271, 443. Firefly (Barr, Jones, Wells).—Flower light Brazil red (5 h) on deep dull yellow, $3\frac{1}{2}$ inches in diameter, freely produced; florets long, slightly quilled; plant bushy, $1\frac{1}{2}$ foot; late September.

238. Flame (Jones).—Flowers carmine-red (2 h) on deep dull yellow, 3 inches in diameter; florets slightly incurved, dull yellow reverse; plant irregular, spreading, 2 feet; mid-September.

21, 459. Francis (Barr, Wells).—Flower lemon-yellow (23), completely shaded with pale carmine (1 h), which fades as the flower ages, 3 inches in diameter, very freely produced; florets long, inclined to be quilled; plant bushy, $1\frac{1}{2}$ foot; early September.

56. F. Wilson (Simpson), **A.M.** September 25, 1914.—Flower light carrot red (7' c), $2\frac{1}{2}$ inches in diameter, very freely produced; florets slightly incurved; plant stiff and bushy, $1\frac{1}{2}$ foot; late September.

305. Gertie (Jones), **A.M.** September 23, 1902.—Flower English red (7 i) on dull lemon-yellow (23), 3 inches in diameter, freely produced; florets long; plant bushy, $1\frac{3}{4}$ foot; early October.

254. Howard H. Crane (Jones).—Flower scarlet (4 h) on dull lemon-yellow (23), 3 inches in diameter, freely produced; florets slightly quilled; plant bushy, $1\frac{1}{2}$ foot; early October.

445. H. H. Crane (Wells).—Stock mixed.

150. Illumination (Dobbie).—Flower lemon-chrome (21), heavily shaded light Brazil red (5 i), $3\frac{1}{4}$ inches in diameter, scantily produced; florets slightly incurved; plant straggling, $1\frac{3}{4}$ foot; mid-October.

346. Jack (Jones).—Flower light carmine-scarlet (4 i) with the deep lemon-chrome (23) ground showing through in patches on each floret, $2\frac{1}{4}$ inches in diameter, hemispherical; plant bushy, $1\frac{3}{4}$ foot; late September.

251. Lady Salt (Jones).—Flowers Brazil red (5 i) on lemon-chrome (21), 3 inches in diameter; florets incurved at tip; plant stiff, bushy, 2 feet; mid-October.

316, 430. La Garonne (Jones, Wells).—Flowers light rose red (7 i), shaded with light clear chestnut; florets long; plant stiff, 2½ feet; late September.

299. Le Rhin (Jones).—Flower dull rose red (71) on a faintly yellow ground, 3 inches in diameter; florets long; plant bushy, 1½ foot; mid-October.

510. Le Rhin (Wells).—Failed.

520. Le Tibre (Wells) —Stock mixed.

315. Iena (Jones).—Flower deep lemon-chrome (23), with a dull scarlet (5 h) shading, 3 inches in diameter, very freely produced; florets acute; plant bushy, 1 foot; early September.

9, 272, 428. Minnie Carpenter, XXX October 16, 1914 (Barr, Jones, Wells).—Flower dragon's-blood red (5 i), 3½ inches in diameter; florets long, acute; plant stiff, 2 feet, producing few but good flowers; early October.

133. Mrs. Wheeler (Jones).—Flower light pomegranate purple (71 i) on pale dull yellow, 3 inches in diameter; florets stiff; plant bushy, short flower-stalks, 1½ foot; early October.

104. Mrs. Willis (Dobbie).—Flower dull pale yellow, striped and shaded with pale carmine (1), 3 inches in diameter; florets incurved at tips; plant bushy, 1½ foot; mid-September.

100, 287, 474. Nina Blick (Dobbie, Jones, Wells), A.M. September 15, 1910.—Flower lemon-chrome (21), shaded with chestnut-red, 2¾ inches in diameter, freely produced; plants bushy, 1¾ foot; mid-September.

289. October Gold (Jones), A.M. October 25, 1910.—Flowers dull lemon-yellow (23), shaded carmine-red (2 h); plant spreading, 1½ foot; late October.

118, 334. Orange (Dobbie, Jones).—Flowers light rose red (71) on dull yellow, 3½ inches in diameter; florets incurved at the tip; plant bushy, 2 feet; early October.

13, 84, 282, 455. Polly (Barr, Dobbie, Jones, Wells), A.M. September 29, 1910.—Flower lemon-chrome (21), flushed with scarlet (5), 3½ inches in diameter, freely produced; florets long; plant bushy, 1½ foot; mid-September.

335. Rocket (Jones).—Flower deep lemon-chrome (21), with a passing shading of light carmine (1), 3½ inches in diameter, very freely produced; plant bushy; 1¾ foot; mid-September.

37, 101, 261, 523. Rosie (Barr, Dobbie, Jones, Wells).—Flower nopal red (3 i) on a pale dull yellow ground, 3 inches in diameter, freely produced; florets semi-quilled, orange reverse; plant bushy, 1½ foot; mid-September.

507. Tottie (Wells).—Flower scarlet-red (4 i) on pale yellow, the red deepening as the season advances, 3 inches in diameter, freely produced; plant bushy, 1½ foot; early September.

127, 432. Tonkin (Dobbie, Wells), A.M. October 16, 1914.—Flower light xanthine orange (13 i), 3½ inches in diameter; florets long, pale orange-yellow below; plant erect, bushy, 2½ feet; late September.

5, 543. Verona (Barr, Wells).—Flower apricot-orange (69 i), $2\frac{1}{2}$ inches in diameter ; plant sprawling, 1 foot ; late September.

116, 560. Wells' Scarlet (Dobbie, Wells), **A.M.** October 25, 1910.—Flower carmine-red (2 h) flush on deep lemon-yellow (21), $2\frac{1}{2}$ inches in diameter, very freely produced ; plant bushy, compact, $1\frac{1}{2}$ foot ; late September.

156. Wm. Scott (Jones).—Flower carmine-red (2 h) on lemon-chrome (21), $2\frac{1}{2}$ inches in diameter ; florets straight ; plant spreading, 1 foot ; August.

SECTION XI.—*Flowers* BRONZE.

504. A. Barnham (Wells), **XXX** October 16, 1914.—Flower deep dull rose red (7 i) on pale dull yellow, 3 inches in diameter ; plants bushy, with a good, rounded head, 2 feet ; mid-October. This variety is said to be a sport from 'Eden' (Sec. IV.).

65, 537. Abercorn Beauty (Dobbie ; Wells), **A.M.** September 15, 1910.—A sport from 'Polly' (Sec. X.). Flower lemon-yellow, deeply shaded with chestnut red.

159. Beauty (Jones).—Flower deep lemon-chrome (23) with a heavy rosy chestnut shading on the older florets.

82, 427. Bronze Goacher (Dobbie, Wells), **A.M.** October 24, 1911.—A sport from 'Goacher's Crimson' (Sec. XIV.). Flower deep lemon-chrome (23), with a deep dull scarlet (5) shading, when older becoming dull orange-chrome (11 h).

533. Cecil Wells (Wells), **A.M.** September 29, 1910.—Flower deep lemon-yellow (23), shaded dull chestnut red at the base of each floret, 4 inches in diameter ; plant stiff, 2 feet ; early October.

524. Comtesse Foucher de Cariel (Wells), **A.M.** October 22, 1897.—Flower deep dull scarlet (5 h) on a ground of lemon-chrome (21), small, as the plants made very poor growth ; early October.

330. Gertie Gosney (Jones).—Flower light carmine (1 i) on lemon-chrome (21), 3 inches in diameter, very freely produced ; plant bushy, 2 feet ; early October.

107. Kuroki (Dobbie).—Flower deep dull carmine-scarlet (2 i) on creamy yellow, $2\frac{3}{4}$ inches in diameter, very freely produced ; florets narrow, paler below ; plant bushy, $1\frac{1}{2}$ foot ; late September.

46, 78, 248, 476. Le Pactole (Barr, Dobbie, Jones, Wells).—Flower lemon-chrome (21), with a light shading of Brazil red (5 i), $3\frac{1}{2}$ inches in diameter ; plant bushy, 2 feet ; mid-October.

64, 298. Le Tage (Dobbie, Jones).—Flower nopal red (3 i) on a ground of light lemon-chrome (21), $4\frac{1}{2}$ inches in diameter ; florets long ; plant bushy, 2 feet ; mid-October.

113, 284, 564. Miss Balfour Melville (Dobbie, Jones, Wells), **A.M.** September 15, 1910.—Flower light cadmium-yellow (19) lightly shaded with chestnut red, 4 inches in diameter, freely borne ; florets long ; plant bushy, 2 feet ; mid-September.

SECTION XII.—*Flowers* CHESTNUT.

175. Agnes (Jones).—Flower dull light carmine (1 i) on a pale dull yellow ground, 3 inches in diameter; florets quilled, straight; plant bushy, 2 feet; early October.

140, 467. Crimson Marie Masse (Jones, Wells).—Flower dull scarlet on pale yellow. A variety with the habit, stature, and flower form of 'Mme. Marie Masse' (Sec. IV.).

71, 181, 514. Crimson Polly (Dobbie, Jones, Wells), **A.M.** September 10, 1912.—Flower light cadmium-yellow, heavily shaded light carmine (1 i). A sport from 'Polly' (Sec. X.).

479. Evelyn (Wells), **A.M.** September 25, 1914.—Flower carmine (1 i) on pale dull yellow, 3 inches in diameter, very freely produced; florets quilled, straight; plant bushy, 2½ feet; early October.

247. Fire-dragon (Jones).—Flower carmine-scarlet (2 h) on deep dull yellow ground, 2½ inches in diameter; plant bushy, 2 feet; late September. Very like 'Flame' (Sec. X.), but the flowers are rather darker.

274, 513. Goacher's Terra-cotta (Jones, Wells).—Synonymous with 'Mrs. J. Fielding,' see below.

535. Helena (Wells).—Flower deep lemon-chrome (21), heavily shaded with chestnut red on the face of the florets, 4 inches in diameter; plant stiff, 2 feet; early September.

550. Mandarin (Wells).—Flower nopal red (3 i) on a ground of deep dull yellow, 3 inches in diameter, very freely produced; florets tubular, wide open at tip; plant spreading, 1½ foot; mid-October.

75, 300, 485. Mrs. J. Fielding (Dobbie, Jones, Wells), **A.M.** September 25, 1914.—A chestnut sport from 'Goacher's Crimson' (Sec. XIV.).

SECTION XIII.—*Flowers* CHESTNUT-CRIMSON.

165, 501. Almirante (Jones, Wells), **A.M.** September 25, 1914.—Flower bright nopal red (5 i) on a deep lemon-chrome (21) ground, with a purplish sheen, 3¼ inches in diameter, very freely produced; florets long; plant very bushy, 2 feet; mid-October.

174. Canite (Jones).—Flower deep rosy scarlet on a ground of dull light yellow, 3 inches in diameter; florets long; plant spreading, poor, 1½ foot; mid-October.

508. Crimson Grunnerwald (Wells).—Flower lemon-chrome (21), with a heavy passing shading of deep nopal red (3 i). A sport from 'Gustave Grunnerwald' (Sec. III.).

26, 342, 448. Ethel Blades (Barr, Jones, Wells).—Flower nopal red (3 i), apricot-yellow (19 b) reverse to the florets, 3 inches in diameter; plant spreading, 2½ feet; early October.

303, 548. L'Argenteuillaise (Jones, Wells).—Flower carmine-scarlet (2 h) on deep lemon-chrome (21) ground, 3½ inches in diameter, freely produced; plant bushy, with a good rounded head, 2½ feet; early October.

41. Red Diana (Barr).—Flower chestnut red on deep lemon-chrome (21), paler and duller on the reverse of the florets, $2\frac{1}{2}$ inches in diameter ; plant bushy, $1\frac{1}{2}$ foot ; mid-September. In form very like 'Diana' (Sec. X.), and probably a sport from that variety.

112. Vésuve (Dobbie).—Flower bright ox-blood red (1 k), $3\frac{1}{4}$ inches in diameter ; florets long ; plant bushy, $2\frac{1}{2}$ feet ; mid-October.

SECTION XIV.—*Flowers* CRIMSON.

153. Brightness (Jones).—Flower deep carmine (1 i) on a faintly yellow ground, 4 inches in diameter very freely produced ; plant bushy, $1\frac{1}{2}$ foot ; mid-September.

557. Chaldon (Wells).—Flower ox-blood red (1 k), the dull yellow ground showing at the tip of each floret, 3 inches in diameter, very freely produced ; plant bushy, with a good rounded head, 2 feet ; mid-October.

90, 259, 442. Crimson Diana (Dobbie, Jones, Wells), **XXX** September 25, 1914.—Flower carmine (1 i) on a deep yellow ground. A sport from 'Diana' (Sec. X.).

318. Fred Bunstead (Jones).—Flower deep carmine (1 i), paler and yellowish on reverse of the florets, $4\frac{1}{2}$ inches in diameter ; plant bushy, 2 feet ; mid-October.

285. Gertrude Hobbs (Jones).—Flower carmine-red (4 h) on a dull, yellowish ground, $3\frac{1}{2}$ inches in diameter ; florets long ; plant poor, very spreading, $1\frac{1}{2}$ foot ; late September.

40, 86, 340, 559. Goacher's Crimson (Barr, Dobbie, Jones, Wells), **A.M.** September 10, 1901.—Flower deep carmine (1 i) on a ground of deep dull lemon-chrome (21) ; florets long ; plant stiff, bushy, 2 feet ; mid-September.

469. Mme. Drouard (Wells), **XXX** October 16, 1914.—Flower carmine (1 i) on a ground of dull lemon-chrome (21), 4 inches in diameter ; florets long ; plant bushy, $2\frac{1}{4}$ feet ; mid-October.

196, 378. Mrs. C. Curtis (Jones, Wells).—Flower deep carmine (1 i) on a dull yellow ground, $3\frac{1}{2}$ inches in diameter ; florets in 5-7 whorls, showing a disc ; habit irregular, $1\frac{1}{2}$ foot ; late September.

544. Mrs. E. V. Freeman (Wells).—Flower deep carmine-red (2 i), pale yellowish red on the reverse of the rather long florets, 4 inches in diameter ; plant spreading, $1\frac{1}{2}$ foot ; late October.

277. Mrs. Tom White (Jones), **A.M.** October 25, 1910.—Flower carmine (1 i), $3\frac{1}{4}$ inches in diameter ; florets quilled ; plant bushy, 2 feet ; mid-October.

88, 252, 517. Mrs. W. Sydenham (Dobbie, Jones, Wells), **A.M.** September 25, 1914.—Flower deep carmine (1 i), 3 inches in diameter, very freely produced ; florets reflexed at the tip ; plant bushy, $1\frac{1}{2}$ foot ; early September.

242. Nina Williams (Jones).—Flower carmine (1 i) on a ground of deep dull yellow, 3 inches in diameter ; florets somewhat incurved ; plant poor, $1\frac{1}{2}$ foot ; mid-October.

80. Radiance (Dobbie).—Flower nopal red (3 i) on a ground of

lemon-chrome (21), 2½ inches in diameter ; plant bushy, 1½ foot ; early October.

324, 561. Roi des Précoces (Jones, Wells).—Flower bright carmine (1 i), 3 inches in diameter, freely produced ; florets slightly quilled towards the tips, few, with a distinct disc ; plant spreading, 2 feet ; late September.

233. Vulcan (Jones).—Flower light carmine (1 i) on a dull, yellowish ground, 3 inches in diameter ; florets long ; plant bushy, 2 feet ; mid-October.

117, 234, 555. Wells' Crimson (Dobbie, Jones, Wells).—Flower deep rosy carmine (1 i), 3 inches in diameter, very freely produced ; florets orange-yellow at tip, broad ; plant bushy, long, stiff stems, 2½ feet ; mid-October.

SECTION XV.—*Flowers* ROSE CRIMSON.

170, 495. Champagne (Jones, Wells).—Flower deep pomegranate purple (71 i), yellowish at base of each floret, 3½ inches in diameter, very freely produced ; florets long ; plant bushy, 2 feet ; mid-October.

139. Cherry (Jones).—Flower carmine-red (2 h), 3¼ inches in diameter ; florets long, almost white reverse ; plant bushy, 2 feet ; late September.

111, 337. Ernest Baltet (Dobbie, Jones), **XXX** October 16, 1914.—Flower rose red (71) on a dull, yellowish ground, 2½ inches in diameter ; plant stiff, 2 feet ; early October.

244. Flambeau (Jones), **XXX** October 16, 1914.—Flower very bright carmine (1 i) on a slightly yellow ground, 3¼ inches in diameter, florets long ; plant stiff, bushy, 2¼ feet ; mid-October.

114. Fleuve Rouge (Dobbie), **XXX** October 16, 1914.—Synonymous with 'Flambeau.'

273. Marvel (Jones).—Flower deep pomegranate purple (71 i), 3 inches in diameter ; plant bushy, 2 feet ; late September.

POMPON VARIETIES.

SECTION XVI.

i. Gladys Gray (Barr).—Flower lemon-chrome (21), 1½ inch in diameter ; plant lax, 2 feet ; early October.

7. Little Bob (Barr).—The plants of this stock made such poor growth as to be quite out of character. Flower chestnut

SINGLE VARIETIES.

SECTION XVII.—*Flowers* WHITE.

377. Eva Grantham (Jones).—Flower white, 2½ inches in diameter, disc ½ inch, very freely produced ; plant forming a rounded bush, 1½ foot ; early September.

3, 410. Florence Gillham (Barr, Wells).—Flower white, very freely produced, 2½ inches in diameter, disc ¾ inch ; plant bushy, 2 feet early September.

350. Lily Ovenden (Wells).—Flower white, 2 inches in diameter, ray florets in 3 or 4 whorls, disc $\frac{3}{8}$ inch; plant spreading, $1\frac{1}{4}$ foot; early September.

417. Little Nell (Wells).—Flower white, very freely produced, 2 inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{4}$ foot; early October.

584. Mrs. Earle (Wells).—Flower white, $2\frac{1}{2}$ inches in diameter, ray florets in 4 whorls, disc $\frac{3}{8}$ inch; plant stiff, $2\frac{1}{2}$ feet; late September.

582. Phyllis Cowley (Wells).—Flower white, becoming shaded with pink when aged, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{2}$ foot; early September.

147. Silver Queen (Jones).—Flower white, taking a pink tinge with age, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch, plant bushy, $1\frac{3}{4}$ foot; late October.

198. Starlight (Jones).—Flower white, 2 inches in diameter disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{2}$ foot; mid-October.

400. Walton Bradbury (Wells).—Flower white, $3\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch; plant bushy, $1\frac{1}{2}$ foot; early September.

571. White City (Wells).—Flower white, 3 inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{3}{4}$ foot; early September.

143. White Star (Jones).—Flower white, just tinged with pink when fully opened, florets incurved; plant bushy, $1\frac{1}{2}$ foot; mid-September. A distinct variety.

SECTION XVIII.—*Flowers PINK.*

390. Endsleigh (Wells).—Flower amaranth-pink (69 c), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant spreading, $1\frac{1}{2}$ foot; mid-September.

389. Esther (Wells).—Flower amaranth-pink (69 e), 2 inches in diameter, disc $\frac{3}{8}$ inch, on long stalks; plant bushy, $1\frac{1}{2}$ foot; early October.

395. Greeneye (Wells).—Flower deep amaranth-pink (69 d), very freely produced, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{4}$ foot; early September.

51, 565. Kitty Riches (Barr, Wells).—Flower amaranth-pink (69 e), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant stiff, 2 feet; late October.

191. Kitty Riches (Jones).—Failed to flower.

566. Miss Vida White (Wells).—Flower pale amaranth-pink (69 f), very freely produced, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch, pale; plant bushy, 2 feet; late October.

572. Pink Gem (Wells).—Flower pale amaranth-pink (69 f), 3 inches in diameter, ray florets in 2 whorls, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{4}$ foot; mid-September.

197. Pink Perfection (Jones).—Flower pale amaranth pink (69 f), freely produced, 2 inches in diameter, ray florets in 2 whorls, disc $\frac{1}{2}$ inch; plant bushy, 2 feet; mid-October.

SECTION XIX.—*Flowers* MAUVE-PINK.

359. Alice Smith (Wells).—Flower pale amaranth-pink (69 i), $2\frac{1}{4}$ inches in diameter, disc $\frac{3}{8}$ inch; plant bushy, $1\frac{1}{2}$ foot; early September.

10, 360. Brazier's Beauty (Barr, Wells).—Flower mallow-pink (67 e), very freely produced, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant $1\frac{1}{4}$ foot, forming a rounded bush; early September.

225. Capella (Jones).—Flower mallow-purple (67 d), with a white zone around the disc, very freely produced, 2 inches in diameter, disc $\frac{1}{2}$ inch; ray florets in 3 whorls; plant bushy, $2\frac{1}{4}$ feet; late October.

222. Cecil (Jones).—Flower Tyrian pink (69 b), $1\frac{1}{2}$ inch in diameter, disc $\frac{1}{2}$ inch; plant bushy, 2 feet; early September.

573. Charming (Wells).—Flower mallow-purple (67 b), $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch; plant spreading, 1 foot; early October.

581. Ena (Wells).—Flower bright, light mallow-purple (67 e), 3 inches in diameter, ray florets in 4 whorls, disc $\frac{3}{8}$ inch; plant stiff, 2 feet; early September.

11, 386. Good Hope (Barr, Wells).—Flower bright rhodamine purple (67), with a white zone round the disc, $2\frac{1}{4}$ inches in diameter; ray florets in 2 whorls, disc $\frac{1}{2}$ inch; plant bushy, 2 feet; early October.

210. Good Hope (Jones).—Failed to flower.

219. Kent (Jones).—Flower mallow-purple (67 b), 3 inches in diameter, good shape, ray florets in 2 whorls, disc $\frac{3}{8}$ inch; plant bushy, $2\frac{1}{2}$ feet; mid-October.

192. Marjorie (Jones).—Flower mallow-purple (67 d), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant spreading, 2 feet; mid-October.

199. May (Jones), XXX October 16, 1914.—Flower mallow-purple (67 b), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{2}$ foot; mid-September.

211, 411, 416. Monarch (Jones, Wells).—Flower mallow-purple (67 b), very freely produced, $2\frac{1}{2}$ inches in diameter, ray florets in 2 whorls, disc $\frac{3}{8}$ inch; plant bushy, $1\frac{1}{2}$ foot; early September.

384. Olive (Wells).—Flower mallow-pink (67 f), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant poor, 1 foot; early September.

382. Robert Johnson (Wells).—Flower mallow-pink (67 b), yellowish near disc, 2 inches in diameter, disc $\frac{1}{2}$ inch; plant very bushy, $1\frac{3}{4}$ foot; early October.

16, 408. Surrey (Barr, Wells).—Flower deep Tyrian pink (69 b), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant spreading, $1\frac{1}{2}$ foot; early September.

SECTION XX.—*Flowers* PURPLE.

372. Canopus (Wells).—Flower light amaranth-purple (69 i), very freely produced, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{4}$ foot; mid-September.

237. Cetus (Jones).—Flower deep pomegranate purple (71 i),

with a yellowish zone round disc, $2\frac{1}{2}$ inches in diameter, ray florets in 2 whorls, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{2}$ foot; late October.

215. Eclipse (Jones).—Flower amaranth-purple (69 i), $2\frac{1}{2}$ inches in diameter, ray florets in 3 whorls, disc $\frac{1}{2}$ inch; plant spreading, $1\frac{3}{4}$ foot; mid-October.

15. Formidable (Barr).—Flower amaranth-purple (69 i), 2 inches in diameter, disc $\frac{3}{8}$ inch; plant bushy, 2 feet; early September.

216. Glorious (Jones), A.M. November 6, 1900.—Flower light aster purple (67 h), $2\frac{1}{2}$ inches in diameter, ray florets in 3 whorls, disc $\frac{3}{8}$ inch; plant bushy, 2 feet; mid-September. Very like 'Merstham Glory.'

397. Hilda's Favourite (Wells).—Flower deep pomegranate purple (71 i), with a slightly yellow base to the ray florets, 2 inches in diameter, disc $\frac{3}{8}$ inches, very freely produced; plant bushy, $1\frac{1}{4}$ foot; mid-September.

399. Merstham Glory (Wells).—Flower light aster purple (67 h), 2 inches in diameter, ray florets in 2 or 3 whorls; disc $\frac{3}{8}$ inch; plant bushy, $1\frac{3}{4}$ foot; early September.

189. Pride of Merstham (Jones).—Flower bright amaranth purple (69 h), very freely produced, 2 inches in diameter, disc $\frac{1}{2}$ inch; plant spreading, $1\frac{1}{2}$ foot; early September.

379. Purple Prince (Wells).—Flower light amaranth-purple (69 i), 3 inches in diameter, disc $\frac{1}{2}$ inch; ray florets semi-quilled; plant spreading, 1 foot; mid-September.

201. Pyrethrum (Jones).—Flower deep rhodamine purple (67), with a white zone around the disc, $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch; plant bushy, with a good rounded head, $2\frac{1}{4}$ feet; mid-October.

177. Ruby Queen (Jones).—Flower deep bright pomegranate purple (71 i), $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch; plant poor, $1\frac{1}{2}$ foot; mid-October.

401. The Carlton (Wells).—Flower amaranth-purple (69 i), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, 2 feet; late September.

149, 415. The Downs (Jones, Wells).—Flower light amaranth-purple (69 i), $3\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch, ray florets in 3 whorls; plant stiff, bushy, $2\frac{1}{2}$ feet; early October.

145. Venus (Jones).—Flower aster purple (67 i), 3 inches in diameter, disc $\frac{1}{2}$ inch; plant bushy, $1\frac{1}{2}$ foot; early October.

SECTION XXI.—*Flowers* CRIMSON.

574. Carrie Luxford (Wells).—Flower dull, light carmine (1 i) with a yellow zone round disc, $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch; plant bushy, good rounded head, 2 feet; early September.

217. Crimson Queen (Jones), A.M. October 25, 1910.—Flower carmine-red (2 h) on a deep yellow ground, very freely produced, 3 inches in diameter, disc $\frac{1}{2}$ inch, ray florets in 4 whorls; plant bushy, $1\frac{1}{2}$ foot; early September.

569. Darkie (Wells).—Flower ox-blood red (1 k), very freely

produced, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; mid-October.

351. Dean (Wells).—Flower light carmine (1 i) with a zone of deep lemon-yellow (23) round the disc, $1\frac{1}{2}$ inch in diameter, disc $1\frac{1}{4}$ inch, ray florets in 2 whorls ; plant bushy, $1\frac{1}{4}$ foot ; early September.

57. Doris Palmer (Simpson).—The plants received under this name were indistinguishable from 'Firebrand,' see below.

575. Dr. Ingram (Wells).—This stock was 'Carrie Luxford' (Sec. XXI.).

227. Evelyn Neale (Jones).—Failed to flower.

380. Evelyn Neale (Wells).—Flower carmine (1 i) on a dull yellow ground, well formed, $2\frac{3}{4}$ inches in diameter, disc $\frac{3}{8}$ inch ; plant weak, bushy, $1\frac{1}{4}$ foot ; mid-September.

14, 373. Firebrand (Barr, Wells).—Flower bright nopal red (3 i) on a yellowish ground, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch, ray florets quilled, in several whorls, flowers in good sprays ; plant erect, bushy, $2\frac{1}{2}$ feet ; mid-September.

50, 577. Gem of Merstham (Barr, Wells).—Flower light ox-blood red (1 k), 2 inches in diameter, freely produced, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

576. Goldlace (Wells).—Flower deep, dull rose-red (71), the ground of deep lemon-yellow (23) showing clearly at the tip of each floret, $1\frac{3}{4}$ inch in diameter, disc $\frac{1}{2}$ inch, ray florets in 3 whorls ; plant bushy, $1\frac{1}{2}$ foot ; early September.

38, 578. Kate Westlake (Barr, Wells).—Flower light carmine (1 i) on dull yellow, very freely produced, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant stiff, bushy, 2 feet ; early September.

214. Lewisham (Jones).—Flower purplish carmine (1 j), $3\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch, ray florets semi-quilled ; plant poor, 2 feet ; early October.

381. Masterpiece (Wells).—Flower rosy carmine (1 i) with a lemon-yellow (21) zone around the disc, 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{4}$ foot ; early September.

195. Pathfinder (Jones).—The plants of this variety made such poor growth as to be out of character. Flower light carmine (1 i), on pale dull yellow.

361. Robin (Wells).—Flower carmine (1 i) on a ground of lemon-yellow (23), 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant spreading, 1 foot ; early September.

388. Ruby (Wells).—Flower carmine-red (2 h), $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant stiff, 2 feet ; early September.

SECTION XXII.—*Flowers* CHESTNUT.

394. A. J. Foster (Wells).—Flower dull rosy scarlet on a pale yellow ground, $2\frac{1}{4}$ inches in diameter, scantily produced, disc $\frac{3}{4}$ inch ; plant lax, 2 feet ; mid-September.

392. A. W. Seabrook (Wells).—Flower dull ox-blood red, on a deep

yellow ground, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

235. Belle (Jones).—Flower nopal red (3 i), with a pale dull yellow zone around the disc, 2 inches in diameter ; ray florets in two whorls ; plant bushy, 2 feet ; early October.

221, 354. Eric (Jones, Wells).—Flower nopal red on a ground of dull lemon-chrome (21), $2\frac{1}{4}$ inches in diameter, disc $\frac{3}{8}$ inch ; ray florets in several whorls ; plant stiff, $1\frac{3}{4}$ foot ; early October.

368. Gracie (Wells).—Flower dull rose red (71), shaded chestnut, $1\frac{3}{4}$ inch in diameter, disc $\frac{3}{8}$ inch ; ray florets in 2 whorls, spathulate ; plant bushy, $1\frac{1}{2}$ foot ; mid-September.

407. Prolific (Wells).—Flower carmine-red (4i), 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

412. W. A. Cull (Wells).—Flower deep scarlet (5) on a ground of lemon-chrome (23), $2\frac{1}{4}$ inches in diameter, disc $\frac{3}{8}$ inch ; plant forming a rounded bush, $1\frac{1}{2}$ foot ; mid-September.

SECTION XXIII.—*Flowers* TERRA-COTTA.

224. Ambassador (Jones).—Flower deep lemon-chrome (23) with a patchy, reddish shading, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{3}{4}$ foot ; mid-September.

383. Beauty (Wells).—Flower lemon-chrome (23), splashed and streaked with scarlet (5), 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant spreading, 1 foot ; early October. See 'Beauty,' a bronze decorative variety (Sec. XI.).

236. Brigadier (Jones).—Flower light carmine-red (2 h) on a ground of pale yellow, $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$; plant spreading, $1\frac{1}{2}$ foot ; early September.

366. Donald (Wells).—Flower carmine-red (1 h) on a pale, dull yellow ground, 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant very poor, $1\frac{1}{4}$ foot ; early September.

358. Dorando (Wells).—The plants of this variety made poor growth and were out of character. Flower pale scarlet (5) on pale yellow.

364. Fortune's Favourite (Wells).—Flower light rosy scarlet (5 h), on a ground of pale lemon-yellow (21), 3 inches in diameter, disc $\frac{1}{2}$ inch ; plant irregular, $1\frac{1}{2}$ foot ; early September.

405. Holmthorpe (Wells).—Flower deep scarlet (5 h) on a deep yellow ground, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant weak, spreading, $1\frac{1}{4}$ foot ; early September.

393. J. H. Runchman (Wells).—Flower light ox-blood red (1 k) shading, on a lemon-yellow ground (23), with a zone of the latter colour round the disc, 2 inches in diameter, disc $\frac{1}{2}$ inch ; plant spreading, 1 foot ; mid-October.

193. John Newton (Jones).—Indistinguishable from 'W. Newton.'

367. Kathleen (Wells).—Flower dull, deep yellow, with a passing shading of carmine-red (2 h), 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{4}$ foot ; early September.

352. Majestic (Wells).—Flower scarlet-red (2) on a lemon-yellow (23) ground, $2\frac{1}{4}$ inches in diameter, disc $\frac{1}{4}$ inch ; plant stiff, 2 feet ; late October.

583. Mary (Wells).—Flower dull scarlet (5 h) on a pale yellow ground, 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant stiff, $1\frac{1}{2}$ foot ; mid-September.

370. Mrs. Alec Thompson (Wells).—Flower light carmine-red (2 h) on a ground of dull yellow, $2\frac{1}{4}$ inches in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September. See 'Mrs. A. Thomson,' a yellow decorative variety (Sec. VIII.).

406. Nellie Riding (Wells), XXX October 16, 1914.—Flower deep scarlet (5 h) on a lemon-yellow (23) ground, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; long, stiff peduncles ; plant stiff, $2\frac{1}{2}$ feet ; early October.

402. Rockshaw (Wells).—Flower dull scarlet (5 h) on a dull yellowish ground, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; mid-September.

190. Royalty (Jones).—Flower lemon-chrome (23) shaded with scarlet (5), very freely produced, $2\frac{1}{4}$ inches in diameter, disc $\frac{3}{8}$ inch ; ray florets in 2 whorls ; plant bushy, $1\frac{1}{2}$ foot ; mid-September.

375. Spitfire (Wells).—Flower dark scarlet (5 h) on a ground of lemon-chrome, $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{3}{4}$ foot ; mid-September.

580. The Navy (Wells).—Flower dull scarlet (5 h) on a ground of light cadmium-yellow (19), 4 inches in diameter, disc $\frac{3}{4}$ inch ; ray florets slightly quilled ; plant bushy, $1\frac{1}{4}$ foot ; mid-October.

418. W. Newton (Wells).—Flower scarlet (5) on a ground of lemon-chrome (21), $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch ; ray florets in 3 whorls ; plant forming a small, rounded bush, $1\frac{1}{2}$ foot ; early September.

SECTION XXIV.—*Flowers BUFF-RED.*

45, 218, 374. Canada (Barr, Jones, Wells).—Flower pale Corinthian red (3"), yellowish below, freely produced, $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

349. Dora (Wells).—Flower dull, pale pomegranate purple (71 i) on a pale yellow ground, $1\frac{3}{4}$ inch in diameter, disc $\frac{1}{2}$ inch ; ray florets in 3 whorls ; plant spreading, 1 foot ; early September.

362. Dominion (Wells).—Flower light rose red (71) on a lemon yellow (23) ground which shows as a ring round the disc, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy ; mid-September.

213. Madeline (Jones).—Flower rosy scarlet, on dull lemon-yellow (23), freely produced, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant stiff, $2\frac{1}{2}$ feet ; mid-October.

207. Mrs. Watson (Jones).—Flower amaranth-pink (6c f) with a heavy shading of orange (15), 2 inches in diameter, disc $\frac{3}{8}$ inch ; ray florets in 3 whorls ; plant bushy, 2 feet ; late October.

404. Sunset (Wells).—Flower lemon-yellow (23) shaded with rose, (71 b), very freely produced, 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; mid-September.

413. The Dome (Wells).—Flower rose-red (71) on a ground of deep lemon-chrome (21) which appears at the tips of each floret ; $1\frac{3}{4}$ inch in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; mid-September.

SECTION XXV.—*Flowers YELLOW.*

391. Albury (Wells).—Flower maize-yellow (19 f), very freely produced, $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant spreading, 1 foot ; early September.

371. Amber Beauty (Wells).—Flower light lemon-yellow (23), 2 inches in diameter, disc $\frac{3}{8}$ inch ; plant spreading, $1\frac{1}{2}$ foot ; early September.

223. Amber Gem (Jones).—Flower dull pale lemon-chrome (21), with a shading of nopal red (3 i) as the flower ages, $3\frac{1}{2}$ inches in diameter, disc $\frac{5}{8}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; late October.

387. Annie Piper (Wells).—Flower lemon-yellow (23), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, 2 feet ; mid-September.

353. Brightness (Wells).—Flower pale lemon-yellow (23 b), very freely produced, 2 inches in diameter, disc $\frac{3}{8}$ inch ; ray florets in 2 whorls ; plant bushy, $1\frac{3}{4}$ foot ; mid-September. See 'Brightness,' a light crimson decorative variety (Sec. XIV.).

226, 376. China (Jones, Wells).—Flower picric yellow (23 d), $1\frac{3}{4}$ inch in diameter, disc $\frac{3}{8}$ inch ; plant poor, pyramidal, $1\frac{1}{2}$ foot ; mid-September.

369. Dean Swift (Wells).—Flower lemon-chrome (21), with a passing shading of light carmine (1 i), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

396. Dolly (Wells).—Flower lemon-chrome (21), $1\frac{1}{2}$ inch in diameter, scantily produced ; plant bushy, $1\frac{1}{2}$ foot ; mid-September.

579. Joan Carter (Wells), A.M. September 24, 1912.—Flower lemon-chrome (21), $2\frac{1}{2}$ inches diameter, disc $\frac{3}{8}$ inch ; ray florets in several whorls ; plant bushy, $1\frac{1}{2}$ foot ; mid September.

212, 567. Kingcup (Jones, Wells).—Flower light lemon yellow (23), $1\frac{1}{2}$ inch in diameter, disc $\frac{1}{2}$ inch ; ray florets in 2 whorls ; plant bushy, $1\frac{1}{2}$ foot ; early September.

18, 570. Marie Corelli (Barr, Wells).—Flower citron-yellow (23' b), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

30, 365. Nellie King (Barr, Wells).—Flower lemon-yellow (23), $2\frac{1}{2}$ inches in diameter, disc $\frac{3}{8}$ inch, surrounded by a ring of short florets ; ray florets pointed ; plant bushy, $1\frac{1}{2}$ foot ; early September.

206. Nelson (Jones), A.M. October 22, 1889.—Flower lemon-yellow (23), 2 inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; late September.

409. The Moon (Wells).—Flower dull lemon-yellow (23), $1\frac{3}{4}$ inch in diameter, disc $\frac{3}{8}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

385. Yaller-gal (Wells).—Flower deep lemon-yellow (23), $2\frac{1}{2}$ inches in diameter, disc $\frac{1}{2}$ inch ; plant bushy, $1\frac{1}{2}$ foot ; early September.

SECTION XXVI.—Varieties which had not flowered
at the beginning of November.

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|--|--|
| 228. Alice. | 500. Maroccain. |
| 463. Bordeaux. | 204. Nellie Watson. |
| 173, 509. Border Beauty. | 203. Philadelphia. |
| 172. Bronze Queen. | 194. Pink Beauty. |
| 220. Chastity. | 253. Princess. |
| 355. Chestnut. | 264. } Queen of the Earlies. |
| 356. Clarice. | 420. } |
| 129. Dorothy Humphrey. | 187. Resolution. |
| 249. Edie Wright. | 414. Richard. |
| 456. Gatton, A.M. September 29,
1910. | 398. Roderick. |
| 556. Golden Queen of the Earlies,
A.M. October 25, 1898. | 202. Rosy Morn. |
| 489. Hollicot White, A.M. Sep-
tember 13, 1910. | 323. Satin Rose. |
| 258. Holland's Yellow. | 478. Saumon Rouge. |
| 200. Janie. | 568. Snowstorm, A.M. October 25,
1910. |
| 357. Jessie Wallace. | 148. Surprise, A.M. November 22,
1895. |
| 208. Jupiter. | 185. Terra-cotta. |
| 209. Merstham Beauty. | 419. Venerable. |
| 452. Milka. | 255. White Duchess. |
| 205, 363. Minnie. | 493. Yellow Desgranges. |
| 403. Miss Rose. | 154. Yvette Richardson. |

DAHLIAS TRIED AT DUFFRYN, 1914.

THE Society's trial of Dahlias from a garden decorative point of view was again carried out, as last year, by kind permission of Reginald Cory, Esq., at Duffryn, near Cardiff (see vol. xxxix. p. 657), and again proved a great success. As the trial on this occasion was confined to seedlings not yet in commerce, and varieties offered for the first time in 1914, the trial was not so extensive as last year, though some two hundred and forty varieties were sent in. The number of novelties was largely increased both from at home and abroad, showing evidence of a greatly increased interest in these trials. The Pæony-flowered section was the most numerous, no fewer than one hundred and ten varieties being represented. The Collerette section totalled forty-four, the Cactus thirty-three, the Singles thirty-two, the Decorative varieties seventeen, the Pompons three, and one Pompon Cactus. Unfortunately, the first week in September was very wet, with high winds prevailing day after day, so that many of the flowers were damaged and were not seen at their best. At the time of inspection, however, they were rapidly recovering. The Pæony-flowered varieties are advancing, having much better stems than the older forms, but little, if any, improvement was apparent in the Collerette section. The Cactus varieties sent in were a decided improvement on those of last year. Unfortunately, many of them were making a second growth, thus hiding to a certain extent the first flowers. The Decorative section had withstood the wind and rain best of all, and a considerable improvement was noted here in the colours, stem, and freedom of flowering. The other sections did not contain anything that could be called better than the varieties already in commerce. The £5 5s. Cup kindly presented to the Society by Mr. Cory was recommended to be awarded to 'Mrs. J. C. Vaughan,' a Pæony-flowered form; though its first flowers are all double, later in the season it develops a distinct eye.

The trial was admirably carried out and gave evidence of the great care and attention that had been bestowed upon the plants by Mr. Cory, to whom are tendered the grateful thanks of the Society and of all admirers of the Dahlia as a decorative garden plant.

The following Table gives a list of the new varieties which proved most desirable for garden decoration:

DAHLIAS AT DUFFRYN, 1914.

Name.	Sender.	Description.	Height.
CACTUS VARIETIES.			
Astrée . . .	Cayeux & Leclerc	Rich deep pink	4
Beauty . . .	Stredwick	Pink, florets slightly twisted	5
Honesty . . .	West	White, shading to pink	4
Louvain . . .	Dickson & Robinson	Pale yellow, centre shading to pink	4½
Sophocles . . .	Cayeux & Leclerc	Deep terra-cotta	3
COLLERETTE VARIETIES.			
Avon . . .	Dobbie	Vermilion scarlet self, collar shaded lemon	3½
Doon . . .	Dobbie	Bright scarlet self, lemon collar	2½
El Kantara . . .	Cory	Cherry red, collar white	4
Louie Blackman . . .	Stredwick	Buff, suffused vermilion, lemon collar	4
Ruby . . .	Stredwick	Vermilion-scarlet and yellow, lemon collar	3½
Warspite . . .	Stredwick	Crimson-scarlet, collar shaded white	3
SINGLE VARIETIES.			
Crawley Star . . .	Cheal	Rosy pink	4
Oran . . .	Cory	Crimson-scarlet	3½
Stora . . .	Cory	Rosy crimson, yellow disc, large	3½
PEONY-FLOWERED VARIETIES.			
Amber Queen . . .	West	Amber, shaded orange	5
An. Schieber . . .	Pfitzer	Rich yellow	5
Beacon . . .	West	Intense scarlet	5½
Beethoven . . .	Riding	Amber	3½
Berlioz . . .	Riding	Old gold, suffused salmon	5½
Dinant . . .	Dickson & Robinson	Lemon yellow	3½
Great Britain . . .	Warnaar	Mauve	3
Hort. Fiet . . .	Warnaar	Salmon buff	3
Julet . . .	Burrell	Buff, suffused salmon	6
Malnes . . .	Dickson & Robinson	Yellow, suffused vermilion	4½
Melilla . . .	Cory	Clear yellow	3
Mozart . . .	Riding	Bright deep crimson	4
Mrs. J. C. Vaughan	Warnaar	Lemon yellow (cup variety)	4½
Termonde . . .	Dickson & Robinson	Mauve pink	4
Weber . . .	Riding	Rose pink	3½
White Lady . . .	Krelage	White, narrow petals	5
White Seedling . . .	Pfitzer	White	5
DECORATIVE VARIETIES.			
Futurity . . .	West	Salmon	4
Godfrey's Crimson . . .	Godfrey	Bright crimson	5
Mabel . . .	West	Light mauve	4
Maid of all Work . . .	Keynes Williams	Pure white, medium bloom	4
Mrs. Lang . . .	West	Bright crimson	4
Minnie Burtle . . .	Dobbie	Scarlet	4
Mirelle . . .	Cayeux & Leclerc	Pale lemon	5
Offenbach . . .	Riding	Pure yellow	5
Reginald Cory . . .	Cheal	Crimson, tipped white	2½
Sulphurea . . .	West	Sulphur yellow	4

PERENNIAL SUNFLOWERS, HELENIUMS, AND RUDBECKIAS
AT WISLEY, 1914.

REPORT BY C. C. TITCHMARSH, Trials Officer.

FORTY stocks of Perennial Sunflowers were sent to Wisley in the spring of 1914. The plants comprised *Helianthus*, 18 varieties; *Helenium*, 10 varieties; and *Rudbeckia*, 8 varieties. They were planted in a deeply-trenched and well-manured border on the north-east side of the Iris Ditch. With one exception, the plants made excellent growth and were in full flower when examined by a Sub-Committee of the Floral Committee on September 25, 1914.

The hardy herbaceous perennials known as Perennial Sunflowers belong to the genera *Helenium*, *Helianthus*, *Echinacea*, and *Rudbeckia*. They are natives of North America, and *Helianthus* extends to Peru and Chile. Although often confused, these genera present sharply-defined characters, even in those species and their forms which are commonly cultivated.

A full account of *Helianthus* is given by Mr. D. Dewar in this JOURNAL, vol. xv. (1892), pp. 26 *et seq.*

The following varieties were included in the trial :—

No.	Name.	No.	Name.
1.*	<i>Helianthus multiflorus</i> 'H. B. Pollard.'	17.	<i>Rudbeckia laciniata</i> 'Golden Ball.'
2.	<i>Helianthus decapetalus</i> .	18.	<i>Rudbeckia</i> 'Herbstonne.'
3.†	<i>Helianthus rigidus</i> 'Rev. Wolley Dod.'	19.	<i>Helianthus multiflorus</i> 'Étoile d'Or.'
4.	<i>Helianthus orgyalis</i> .	20.	<i>Helianthus multiflorus</i> 'Bouquet d'Or.'
5.	<i>Helianthus multiflorus</i> 'Meteor.'	21.	<i>Helianthus multiflorus</i> 'La Perle.'
6.	<i>Helianthus multiflorus</i> .	22.	<i>Helianthus rigidus grandiflorus</i> .
7.	<i>Helianthus multiflorus maximus</i> .	23.	<i>Rudbeckia speciosa</i> .
8.†	<i>Helianthus multiflorus plenus</i> .	24.	<i>Rudbeckia</i> 'Boule d'Or.'
9.	<i>Helianthus decapetalus nanus</i> .	25.	<i>Rudbeckia</i> 'Goldstrahl.'
10.	<i>Helianthus giganteus</i> .	26.	<i>Rudbeckia maxima</i> .
11.	<i>Helianthus</i> 'Miss Mellish.'	27.	<i>Rudbeckia californica</i> .
12.	<i>Helianthus</i> 'H. G. Moon.'	28.	<i>Rudbeckia</i> 'Golden Glow.'
13.†	<i>Helianthus rigidus semi-plenus</i> .	29.†	<i>Helenium autumnale superbum rubrum</i> .
14.	<i>Helianthus sparsifolius</i> .	30.	<i>Helenium autumnale</i> 'River-ton Beauty.'
15.	<i>Helianthus multiflorus</i> 'Soleil d'Or.'		
16.	<i>Rudbeckia subtomentosa</i> .		

* See footnote, p. 501.

† The Committee considered these to be the most meritorious in the trial.

No.	Name.	No.	Name.
31.†	<i>Helenium autumnale</i> 'River-ton Gem.'	36.†	<i>Helenium autumnale</i> 'Gartensonne.'
32.	<i>Helenium autumnale pumilum</i> .	37.	<i>Helenium autumnale pumilum magnificum</i> .
33.†	<i>Helenium autumnale grandiflorum</i> .	38.	<i>Helenium autumnale</i> 'River-ton Beauty.'
34.	<i>Helenium autumnale</i> 'Tap-low Red.'	39.†	<i>Helenium autumnale</i> 'River-ton Gem.'
35.	<i>Helenium Hoopesii</i> .	40.	<i>Helenium autumnale striatum</i> .

F.C.C. = First-class Certificate.

A.M. = Award of Merit.

HELENIUM.—The disc of the flower raised and rounded.

36. *autumnale* 'Gartensonne' (Barr), **A.M.** September 25, 1914.—The finest and most showy *Helenium* in the Trial. The stems are much branched above the middle, and produce a very large head of great regularity of contour; flowers very numerous, $2\frac{1}{4}$ inches in diameter; disc chestnut-brown; ray florets very broad, clear deep lemon-yellow.

33. *autumnale grandiflorum* (Barr), **A.M.** September 25, 1914.—This variety had the largest flowers of any *Helenium* in the Trial; they are produced in a large, loose head, $3\frac{1}{4}$ inches in diameter; disc large, dull yellow; ray florets lemon-yellow.

32. *autumnale pumilum* (Barr), **F.C.C.** July 28, 1885.—Height 1 foot; habit bushy; stems curved; flower $1\frac{3}{4}$ inch in diameter; disc large, yellow; ray florets in two whorls, lemon-yellow; commenced to flower in early September and continued till November.

37. *autumnale pumilum magnificum* (Barr).—A variety of *H. a. pumilum* which exceeded the height of the type by 1 foot; its flowers were larger and produced over an even longer period.

30, 38. *autumnale* 'Riverton Beauty' (Barr, Ruys), **A.M.** September 14, 1909, under the name 'Riverslea Beauty' (Pritchard). It appears to have arisen in England and America at about the same time.—Reaches $4\frac{1}{2}$ feet; bushy, with a compact head; flowers very numerous, 2 inches in diameter; disc dull yellow; ray florets lemon-yellow.

31, 39. *autumnale* 'Riverton Gem' (Barr, Ruys), **A.M.** September 25, 1914.—Reaches 5 feet; large and compact head; flowers 2 inches in diameter; disc chestnut; ray florets yellow and chestnut-red. Of better habit and has brighter and redder flowers than the next.

40. *autumnale striatum* (Barr), **F.C.C.** August 23, 1892.—Height $3\frac{1}{2}$ feet; flowers very numerous, 2 inches in diameter; disc yellow-brown; ray florets yellow, streaked with chestnut-red. Syn. *H. grandicephalum striatum*.

29. *autumnale superbum rubrum* (Ruys), **A.M.** September 25, 1914.—Height $4\frac{1}{2}$ to 5 feet; rather a poor head; flowers $1\frac{1}{2}$ inch in

† The Committee considered these to be the most meritorious in the trial.

diameter, red and yellow. This variety has more red in its flowers than any other of the tall *Heleniums*.

34. *autumnale* 'Taplow Red' (Barr).—Height $1\frac{1}{2}$ to 2 feet. An extremely floriferous variety. Flowers $1\frac{1}{2}$ inch in diameter; disc deeply coloured; ray florets yellow, more or less heavily streaked and splashed with chestnut-red. Very close to *Helenium autumnale cupreum*.

35. *Hoopesii* (Barr).—Failed to flower.

HELIANTHUS. The disc of the flower flat or slightly domed.

2. *decapetalus* (Barr).—Height $5\frac{1}{2}$ feet; habit erect and branching, the plant forming a dense bush in the shape of an inverted cone; flowers profusely borne on short peduncles, $2\frac{1}{2}$ inches in diameter; disc $\frac{1}{2}$ inch in diameter, dull orange-yellow; ray florets in one whorl, pale lemon-yellow.

9. *decapetalus nanus* (Barr).—Height 24 inches; compact of habit; stem dark; leaves lanceolate, serrate, 4 inches long; flowers freely borne, $1\frac{1}{2}$ inch in diameter; ray florets in a single whorl, lemon-yellow.

10. *giganteus* (Barr).—Height 8 feet; leaves linear lanceolate, somewhat scattered; flowers borne on long, red peduncles, $2\frac{1}{2}$ inches in diameter; disc $\frac{1}{2}$ inch, orange-yellow; ray florets in one whorl, lemon-yellow.

12. 'H. G. Moon' (Barr), A.M. September 25, 1900.—Height $3\frac{1}{2}$ feet; habit compact, dense; flowers held on long, pale-coloured stalks 4 inches in diameter; disc $\frac{3}{4}$ inch, dark brownish-purple; ray florets, deep yellow, somewhat incurved.

6. *multiflorus*.—Height 2– $2\frac{1}{2}$ feet; habit erect, forming a dense bush; leaves cordate, rather large (to $5\frac{1}{2}$ inches long); flowers borne on short stalks, hardly raised above the foliage, $3\frac{1}{2}$ inches in diameter; disc $\frac{3}{4}$ inch, brownish; ray florets in one whorl, broad, lemon-chrome; involucre bracts foliaceous.

20. *multiflorus* 'Bouquet d'Or' (Barr).

19. *multiflorus* 'Étoile d'Or' (Barr).

21. *multiflorus* 'La Perle' (Barr).

These three varieties of *Helianthus multiflorus* follow the type (No. 6) in all characters except that the disc florets are highly developed towards the periphery, becoming deeply 3-toothed, forming a large hemispherical disc, somewhat deeper in tone than the single whorl of ray florets. As one-year plants at Wisley, these three varieties showed but little difference except that 'Étoile d'Or' was of a somewhat lighter tone than 'Bouquet d'Or' or 'La Perle.'

1. *multiflorus* 'H. B. Pollard' (Pollard).—This variety is said to be a sport from *H. multiflorus* 'Soleil d'Or' (No. 15). It resembles that variety in all respects except that the florets are much less quilled, and are, in fact, almost flat.

7. *multiflorus maximus* (Barr).—A variety of *H. multiflorus* (No. 6). It grew larger than the type and was more free-flowering. The plants

reached 5 feet in height ; flowers produced on long stalks, $4\frac{1}{2}$ inches in diameter ; ray florets in two whorls, broad, lemon-chrome ; disc brownish to dull yellow.

5. *multiflorus* 'Meteor' (Barr).—A variety of *H. multiflorus*, several days earlier than the type, but resembling it in habit and stature. The florets of the disc are highly developed and of a duller tone of lemon-chrome (21) than the single whorl of ray florets. The flower measured $3\frac{1}{2}$ inches in diameter.

8. *multiflorus plenus* (Barr), A.M. September 25, 1914.—Resembles the type (No. 6) in habit and stature, but has paler stems. The flower is $4\frac{1}{2}$ inches in diameter ; the disc is almost hemispherical, 3 inches in diameter, and composed of highly-developed florets, which in the periphery of the disc are almost ligulate and deeply toothed. The ray florets are broad, rather short, and a deep shade of lemon-chrome.

15. *multiflorus* 'Soleil d'Or' (Barr).—A variety of *H. multiflorus* having double flowers with quilled florets. The flowers are $3\frac{1}{2}$ inches in diameter, lemon-chrome.

4. *orgvalis* (Barr).—The Willow-leaved Sunflower Height 8–10 feet ; stem smooth, glabrous, purplish, very leafy along its whole length ; leaves alternate, narrow, almost linear, acute, entire, recurved, 5–10 inches long, thin, glabrous. The flowers failed to open, possibly on account of the sharp frosts in late September and early October, although it produced an abundance of flower buds in the axils of the upper leaves.

22. *rigidus grandiflorus* (Barr).—Height 4–5 feet ; stems stiff, purplish, scabrous ; upper leaves opposite, entire, hispid, scabrous, acuminate ; involucre bracts ovate acute ; flower $3\frac{1}{2}$ inches in diameter ; disc purplish-brown ; ray florets in one or two whorls, light lemon-chrome.

11. *rigidus* 'Miss Mellish' (Barr), A.M. August 29, 1893.—Height 8 feet ; the flowers commenced to open in mid-September and continued until the end of October, were freely produced on long stiff stalks, and averaged $4\frac{1}{2}$ inches in diameter ; disc $\frac{3}{4}$ inch, black, becoming orange-yellow when all the florets are open ; ray florets long, incurved, inclined to be a little quilled, deep glowing lemon-chrome. A fine variety both for the garden and for cutting.

14. *rigidus* 'Rev. Wolley Dod' (Barr), A.M. September 25, 1914.—Resembles *H. rigidus grandiflorus* in all respects except that the flowers are larger, averaging 4 inches in diameter, with a smaller disc ($\frac{1}{2}$ inch in diameter), and of a brighter colour. The ray florets are in two whorls, light lemon-chrome.

13. *rigidus semiplenus* (Barr), F.C.C. September 25, 1888.—This variety bore an extremely close resemblance to No. 14, but the ray florets appear to be slightly narrower than in that variety.

3. *sparsifolius* (Barr), A.M. October 18, 1904.—Height 7 feet ; stem stout, rigid, red-purple, scabrid ; leaves large, cordate, serrate. A large number of flower buds were produced on long, stiff peduncles, but failed to open.

RUDBECKIA. The disc of the flower conical or columnar.

17, 24. 'Boule d'Or' (Barr).—A double-flowered variety of *R. laciniata*. The green stem, pinnatisect radical leaves, and cauline leaves are smooth, without hairs. The flowers are quite double, *i.e.* all the florets are ligulate, pointed, forming a spherical inflorescence, deep lemon-yellow. This variety was also sent by Messrs. Barr as *R.* 'Golden Ball.'

27. *californica* (Barr), A.M. July 21, 1891.—Height 3 feet; stem smooth below, ribbed above; has a grey bloom; radical leaves very deeply 4-10 pinnatisect, serrate, thickly clothed with short, stiff hairs; cauline leaves simple, entire, ovate; flowers few, 3 inches in diameter; 7-9 ray florets, $\frac{3}{8}$ inch wide, lemon-chrome; disc $\frac{3}{4}$ inch high, green to dull citrine.

28. 'Golden Glow' (Barr), A.M. August 10, 1897.—A double-flowered variety of *R. laciniata*, resembling 'R. Boule d'Or' in all respects, but with slightly larger and more numerous flowers than in that variety.

25. 'Goldstrahl' (Barr).—A double-flowered variety of *R. laciniata* which resembles 'R. Boule d'Or' in all respects except that the flowers are slightly larger and a shade deeper in colour.

18. 'Herbstonne' (Barr).—Height 5 feet; stem smooth, pale green; radical leaves in a dense rosette, smooth; flower $4\frac{1}{2}$ inches in diameter; disc $\frac{3}{4}$ inch tall, $\frac{1}{2}$ inch wide at base, dull green; stigmas purplish; ray florets in one whorl, elliptic, broad, one notch at apex; very free-flowering. A very distinct variety.

26. *maxima* (Barr).—Height, 5 feet; stem slightly ribbed below, whole plant glaucous; radical leaves lanceolate, simple; cauline leaves irregularly cordate; flowers borne sparingly, $4\frac{3}{4}$ inches in diameter; disc very tall, $2\frac{1}{2} \times 1$ inch, deep brown-black; ray florets in a single whorl, deep lemon-yellow.

23. *speciosa* (Barr).—Height, 18-24 inches, much branched below; leaves, radical—ovate, in a rosette, strongly ribbed, entire or coarsely toothed, on long, slender stalks; cauline—narrower, gradually becoming sessile in the upper part of the stem; flowers borne singly, 3 inches, in diameter; disc $\frac{3}{4}$ inch, hemispherical, deep brown; ray florets orange-yellow.

MISCELLANEOUS FLOWERING PLANTS AT WISLEY, 1914.

ACONITUM

hybridum Gibsonii (Gibson).—Height $4\frac{1}{2}$ feet. Flowers in terminal and small axillary racemes, large, $1\frac{1}{2}$ inch long, pale violet-blue.

AGERATUM

Mauve Beauty (R. Veitch).—See vol. xxxix. p. 665.

ANTIRRHINUM

Amber Queen, Buff Queen, Carmine Queen, Golden Queen, Maize Queen, Pink Queen, Salmon Queen.—All from Messrs. R. Veitch. See vol. xxxix. p. 635 *et seq.*

Extra Choice Mixed (Forbes).—The plants composing this mixture belong to the "Intermediate" and "Dwarf" sections.

Sutton's Intermediate Mixed (Sutton).—A mixture of pale-flowered plants of the "Intermediate" section.

ASTER

Cloudy Blue (Ballard), A.M. 1914. See p. cxcvi.

Glory of Colwall (Ballard).—Height 5 feet. Flowers borne in long, narrow racemes, $1\frac{1}{2}$ inch in diameter, ray florets light mauve (63'd) in two or more whorls; disc reddish; *Novi-belgii* section.

Grace Mary Lewis (Ballard).—This variety made poor growth and was out of character. It is purple-flowered, and belongs to the *Novi-belgii* section.

Jupiter (Ballard).—Height $4\frac{1}{2}$ feet; flowers borne in large loose panicles, $1\frac{1}{2}$ inch in diameter; ray florets pale mauve (63'f), becoming deep lilac (65 d) at the tips; disc red-brown. *Novi-belgii* section.

Lady Lloyd (Ballard).—Height $3\frac{1}{2}$ feet. Flower 1 inch in diameter; ray florets rose-purple (67'd); disc reddish. *Novi-belgii* section.

Nancy Ballard (Ballard).—Height $3\frac{1}{2}$ feet. Flower $1\frac{1}{2}$ inch in diameter; ray florets, deep rose-purple (67'd), in two or more whorls; disc reddish. *Novae-angliae* section.

Neptune (Ballard).—Height $3\frac{1}{2}$ feet. Flower $1\frac{1}{2}$ inch in diameter; ray florets pale lavender-violet (61'f). *Novi-belgii* section.

Dorothy Sturgis (Peters).—Height 3 feet, forming a rounded bush. Flowers 1 inch in diameter; ray florets light phlox-pink (65 f); disc greenish yellow. *Novi-belgii* section.

Joan Sturgis (Peters).—Height 5 feet, habit and inflorescence of 'Climax.' Flower $1\frac{1}{2}$ inch in diameter, light mauve (63 c); disc Empire yellow (21 b).

Note.—The numbers (*e.g.* 21 b) are the index number of the colours in "Colour Standards and Colour Nomenclature" (Ridgway).

CINERARIA

Matador (R. Veitch).—Flowers scarlet-red, $2\frac{1}{4}$ inches in diameter, borne in large trusses; leaves broadly cordate, dark green, crinkled; plant compact.

Antique Rose (R. Veitch).—Flowers rose-red, passing to rose colour at the tips of florets, $1\frac{3}{4}$ inch in diameter; ray florets broad; leaves hastate, deeply toothed, light green.

CLARKIA

elegans 'Scarlet Beauty' (Sutton).—A free-flowering variety bearing flowers of a deep salmon-rose, $1\frac{1}{2}$ inch diameter.

DAISY

Sutton's Giant Double Pink (Sutton).—A large pale crimson-flowered variety of the well-known double Daisy.

Sutton's Giant Double White (Sutton).—Similar to the variety described above, but bearing white flowers, sometimes striped and speckled with red.

ESCHSCHOLZIA

Carmine King (Gardiner, Dawkins).—Habit variable; a number of plants of a very good bushy type in each stock. Flower of moderate size, rosy carmine, with a white base. Both stocks about 75 per cent. true.

Dainty Queen (Gardiner).—Habit sprawling. Flower large but weak; soft flesh colour. Stock true.

Rajah (Gardiner).—Like 'Carmine King,' but the flowers are a pale magenta-purple. Stock 75 per cent. true.

Mandarin *canaliculata* (Gardiner).—Habit sprawling. Flowers of 75 per cent. of the plants orange-scarlet, 25 per cent. are rose-pink outside and cream inside. In all the flowers the petals are creased with longitudinal furrows.

GODETIA

Giant Rose (Sutton).—Height 20–24 inches. Flowers double, the doubling consisting in a multiplication of the petals, light rose-pink with a rose-red blotch at the base of each petal; stamens rarely exceeding 8. Stock true.

HELIANTHUS

annuus 'Sunrise' (R. Veitch).—This variety was composed of equal numbers of a good branching yellow Sunflower and the variety described on p. 669, vol. xxxix. as Red Sunflower.

annuus 'Sutton's New Red.'—See 'Red Sunflower,' p. 669, vol. xxxix.

KNIPHOFIA

From Messrs. Stark, Ryborough.—A set of Kniphofias resembling *K. Northiae*, but begin to flower rather earlier than that kind. With

the exception of Nos. 5 and 9, the flowers are a rather clearer scarlet than the rosy-scarlet *K. Northiae*.

No. 1. Gloriosa, 4 feet.

No. 2. Giant Seedling, 4½–5 feet. Very like No. 6, but a fortnight later.

No. 3. Little Gem, 2½ feet ; leaves narrow.

No. 4. Starkii, 4–4½ feet ; flowers bright scarlet-red.

No. 5. Decorator, 3–3½ feet ; leaves narrow.

No. 6. Gigantea, 4½–5 feet ; flower-heads rather small in comparison to the size of the plant. The earliest to flower.

No. 7. Grenadier, 3½–4 feet.

No. 8. Glacé, 3–4 feet ; bright scarlet-red.

No. 9. Crimson Gem, 4 feet ; rosy-scarlet.

LARKSPUR

Stock-flowered Rosy Scarlet (Sutton).—Annual. Height 25–30 inches ; foliage segments linear ; flowers double, deep rose colour.

LAVATERA

splendens 'Sunset' (Dawkins). 'Loveliness' (Sutton).—These two plants are compact forms of the well-known garden plant *L. trimestris*. Their large, bright mallow-purple flowers, deeper in colour than the type, were produced throughout the late summer and autumn.

LINARIA

reticulata aurea purpurea (R. Veitch).—Annual. Habit tufted ; height 8 inches ; stem round, glabrous ; leaves linear, channelled ; flowers in a short, crowded raceme ; corolla exceeding the spur, rich purple and orange.

PANSY

Extra Choice Mixed (Forbes).—A mixture containing some good yellow-flowered plants, but the blue and purple forms were poor.

PENTSTEMON

Extra Choice Mixed (Forbes).—See vol. xxxix. p. 668.

PRIMULA

Coral Pink (Sutton).—A variety of *P. sinensis stellata*. The flower is hermosa pink with an edge of eosin pink, the eye is citron yellow, pin-eyed ; leaves palm, petioles deep coloured. The strain is fixed.

SCHIZANTHUS

grandiflorus hybrids (R. Veitch).—See vol. xxxix. p. 669.

SWEET WILLIAM

Scarlet Beauty.—Height 14 inches, uniform. Flower-head large ; flower ½ inch in diameter, bright rose-red. Stock fixed.

Pink Beauty.—Height 15 inches, uniform. Flower-head large ; flower ½ inch in diameter, hermosa pink. Stock fixed.

VERBENA

grandiflora 'Ellen Willmott' (R. Veitch).—See vol. xxxix. p. 672.

FRENCH BEANS AT WISLEY, 1914.

REPORT BY C. C. TITCHMARSH, TRIALS OFFICER.

THE seeds of eighty-three stocks of French Beans were sent to Wisley from various sources during the early part of 1914. Of these seventy-six were dwarf and seven climbing varieties. About 100 seeds of each stock were sown on May 8. Their germination was regular and, on the whole, good. The plants made excellent growth and were twice examined by a sub-committee of the Fruit and Vegetable Committee. Almost without exception, the varieties came into bearing during the week following July 15; neither earliness nor lateness was exhibited to a marked degree by any variety. As might be expected, the dwarf varieties arrived at maturity before the climbers.

The annexed Table gives, in a succinct form, the horticultural and botanical characters of the varieties under trial as well as the Awards granted to the several varieties. The horticultural characters alone are taken into consideration by the Committee in making its recommendations for Award, except in so far that, in cases of varieties which on inspection do not appear to be pure, reference is made to the botanical characters, which are used as indexes of the pureness of the strain. In the table the horticultural characters are placed first as being of essential importance; but, in order to bring together varieties which most nearly resemble one another, use has been made of the readily observed botanical characters. For this purpose the colour of the seed, and secondly the colour of the flower, have been taken as the basis for classification. Thus all black-seeded varieties appear together. Hence, by inspection of the botanical part of the table (columns XIV. to XVIII.), a fairly sure index of the similarity or difference between any two varieties may be obtained. It should, however, be observed that identity of the botanical characters which have been recorded does not necessarily mean that the varieties in question are of similar or of equal economic value.

The Fruit and Vegetable Committee considered that the following varieties possessed conspicuous merit :—

- | | |
|-------------------------------|-----------------------|
| 2.* Allerfrüheste Stuttgarter | 44. Mammoth Six Weeks |
| 5, 8. Canadian Wonder | 60. Perpetual |
| 19. Early Fortyfold | 64. Prolific Negro |
| 22. Early Wonder | 67. St. Andrews |
| 28, 29. Evergreen | 71. Sunrise |
| 30. Excelsior | 73, 74. Superlative |
| 31. Fillbasket | 77. White Model |
| 41. Magpie | |

* See footnote, p. 501.

FRENCH BEANS AT WISLEY, 1914.

BOTANICAL CHARACTERS										HORTICULTURAL CHARACTERS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Characters in which the stock is not true are indicated by the roman numerals which refer to the column in which the character is described.

f Pale — pale lilac-magenta.

tinged lilac-magenta.

MISCELLANEOUS VEGETABLES AT WISLEY, 1914.

BEAN, RUNNER.

Neal's Ne Plus Ultra (R. Veitch) ; Hackwood Park Success (R. Veitch), **A.M.** August 18, 1903 ; Scarlet Emperor (R. Veitch) ; White Emperor (R. Veitch), **A.M.** September 23, 1909 ; see vol. xxxv. pp. 483 *et seq.*

Veitch's Mammoth (R. Veitch).—A variety very like 'Scarlet Emperor,' but the pods are larger, more inclined to curve, and the seed is larger and with rather more black on coat.

BORECOLE.

Drumhead (R. Veitch), **A.M.** November 21, 1905.—See vol. xxxiii. p. 293.

Veitch's New Sprouting (R. Veitch).—See vol. xxxiii. p. 294.

CAPSICUM.

Chameleon (R. Veitch).—Height 18 inches ; stem dark ; foliage of medium size, dark ; fruit freely produced, truncate, with 3-5 points at apex, $1\frac{1}{4}$ inch long, averaging $\frac{1}{2}$ oz., at first greenish-yellow, passing through orange to crimson when ripe ; flavour mild.

CAULIFLOWER.

The following varieties from Messrs. R. Veitch, so far as examination of the young plants could indicate, were from fixed stocks. Unfortunately the exceptionally dry weather of the summer prevented the plants from arriving at maturity, although 'Pride of Italy' and 'Autumn Giant' produced a few good heads.

Danish Wonder, Pride of Italy, The Kaiser, Veitch's Autumn Giant, Veitch's Midsummer Day.

CELERY.

Dunorlan Pink (Caterer).—A red variety producing small, compact sticks ; flavour good. A useful variety, but inferior to and smaller than 'Major Clark's Red,' although resembling that variety.

LETTUCE.

The following varieties of Lettuce were from Messrs. R. Veitch, Exeter :

Bountiful.—A very dwarf cabbage variety. It is not a good "doer" in this dry season.

Early Giant.—A small, compact, round-hearted cabbage variety. Runs to seed early.

Trocadero.—A cabbage variety which quickly ran to seed.

Utility.—A large, compact cabbage variety; leaves brown, much crumpled. Shows little inclination to run to seed.

Dusky Monarch.—A large, brown cos variety.

Golden Crown.—A small, late, very pale green cos variety.

Ne Plus Ultra.—A cos variety; good compact heart, good flavour.

ONION.

Golden Beauty (R. Veitch).—Bulbs somewhat flattened, moderate size, brown skin. Fair crop; good keeper.

Precocity White Globe (R. Veitch).—Bulbs almost spherical; size, medium to small; white. Crop fair, suitable for immediate use only.

Silver Ball (R. Veitch).—Bulbs spherical, small, white; crop good; suitable for pickling. Not a late keeper.

PEA.

Wm. Richardson (Nutting).—Germination good; height $2\frac{1}{2}$ –3 feet; haulm thick; internodes short; foliage deep green, strongly nerved; pods in pairs, 4 inches long, pointed, containing 7–8 oval peas of moderate size; seed wrinkled. A mid-season variety; stock apparently fixed.

Yorkshire Hero (Bruce), *A.M.* Aug. 16, 1910.—This stock is true, but rather more dwarf (not exceeding 3 feet) than that described vol. xxxvi. p. 724.

POTATO.

Drumwhindle (Gavin).—Haulm tall, strong, mid-green. Flowers purple. Tubers round-kidney; eyes few, mostly at apex, shallow; eyebrows distinct; skin light, moderate russeting; flesh white; cooks well. A very good cropper. Apparently a maincrop variety.

Duchess of Cornwall (R. Veitch), *A.M.* October 24, 1905.—See vol. xxxv. p. 494.

Duke of York (R. Veitch).—See vol. xxxv. p. 494.

Early Lidstone (Durham).—Haulm short, procumbent. Tubers flat, oval; eyes few, fairly deep; eyebrows slight; skin white; russeting moderate; flesh white; cooks well. Crop fair. A good cooker.

Late Lidstone (Durham).—Haulm of moderate vigour; foliage rather small, light green, crinkled. Flowers white. Tubers more or less round; eyes mostly at apex, very shallow; eyebrows slight; skin little russeted, white in some plants, pink in others. Produced a large crop of small tubers. Fair cooker.

Great Scot (R. Veitch), *A.M.* Sept. 26, 1911.—See vol. xxxvii. p. 573.

Isis (Brown).—Haulm very strong, erect, dark green. Flower white. Tubers round; eyes scattered, shallow; eyebrows prominent; skin coarsely russeted; crop good. A fair cooker.

Long Set (Laurie).—Haulm strong, long, spreading, mid-green. Flower white. Tubers pebble-shape, regular in size; skin white, very

pale and finely russeted ; eyes mostly at apex, shallow ; eyebrows prominent. Good crop. Cooks very well ; flavour good. Appears to be a mid-season variety.

TOMATO.

Tresco (Bucks).—A variety of vigorous growth, producing enormous leafy inflorescences. A fair proportion of the flowers set, but the peduncle soon becomes bent near the stem owing to the weight of the inflorescence and young fruits. This bending militates against the proper swelling of the fruit.

REPORT OF THE SOCIETY'S CONSULTING CHEMIST.

By DR. J. A. VOELCKER, M.A., F.I.C., F.L.S.

DURING the year 1914, 35 samples were submitted to me by members, as against 19 in the previous year. They were as follows :—

Manures	12
Burnt earth	1
Waters	7
Soils	15

35

1. *Manures*.—The twelve samples consisted mostly of meat meals or bone and meat meals, together with one sample of fish guano, one of hoof meal, and one of phosphatic manure.

The meat meals generally were of good quality, though in one or two cases the prices were somewhat high.

Phosphatic Manure.—This gave the following analysis :—

Moisture	16 17
Organic matter	17 91
*Phosphoric acid	30 97
Lime	31 20
Magnesia &c.	3 10
Insoluble siliceous matter.	65

100 00

* Equal to tribasic phosphate of lime 67 67

This had been guaranteed to contain 73 per cent. of phosphates, and, accordingly, was $5\frac{1}{2}$ per cent. deficient. It was priced at £7 10s. delivered, for cash, and I should consider it excessively dear at this.

Fish Guano.—This contained phosphate of lime 10 71 per cent., nitrogen 10 13 per cent., equal to ammonia 12 30 per cent., and was of decidedly high quality.

Hoof Meal.—The sample of this sent contained :—

Nitrogen	11 30 per cent.
Equal to ammonia.	13 72 per cent.

2. *Burnt Earth*.—A member of the Society sent me from Hertfordshire a sample of burnt earth in the hope that, in the dearth of potash salts caused by the war, it might prove useful as a means of supplying potash to the soil. Analysis of it gave the following results :—

Lime	6 75 per cent.
Phosphoric acid	1 25 " "
Potash	83 " "

This sample of burnt earth contained more lime and phosphoric acid than is generally found, while the percentage of potash was quite good.

A similar sample which I received about the same time from the burning of clay soil in Herefordshire gave:—

Lime	.	.	.	.	.	.	1.19 per cent.
Phosphoric acid	.	.	.	.	.	.	.24 " "
Potash	.	.	.	.	.	.	.83 " "

It must, however, be remembered that, while the application of such burnt earth would supply the soil with certain amounts of potash, phosphoric acid, and lime, these constituents will be present in such insoluble forms that they will only gradually become available for plant use, and a material like burnt earth, though it may eventually enrich the soil, cannot be regarded as in any way taking the place of potash manures for the immediate use of crops.

It would appear to me that, where farmyard manure is not available, the supply of potash could best be made up by the use of a material such as Peruvian guano, which contains naturally an appreciable amount of potash.

3. *Waters.*—(a) A water sent from a new supply was found to be turbid in appearance and to contain a great deal of suspended matter. The matter turned out to consist largely of salts of iron. On analysis, nearly 2 grains per gallon of iron, reckoned as oxide of iron, was found, and this imparted to the water a distinct iron taste which would render it unsuitable for use as a regular drinking supply, and would also cause difficulty in respect of its employment in cooking and washing.

(b) A sample of water was sent with the object of ascertaining whether it was suitable for horticultural purposes and for use in boilers. Analysis gave the following results:—

	Grains per gallon.
Total solid matters	22.90
Chlorine	1.22
Equal to chloride of sodium	2.00
Nitric acid as nitrates	None
Sulphuric acid	3.20
Lime	6.10
Magnesia	1.31
Hardness	15.3 degrees.

Though the hardness of this water was considerable, I should not judge it to be sufficiently so to cause it to be objectionable for general horticultural purposes, though for particular plants, such as *Ericas*, *Azaleas*, and *Rhododendrons*, it might prove unsuitable. The hardness was due to lime and magnesia salts, present both as carbonates and sulphates. For use in boilers such a water must be expected to give rise to a certain amount of difficulty.

(c) On the complaint of a nurseryman that he had difficulty in raising seedling plants, a sample of the water that was used for watering the plants was sent to me. It was stated that hard woody plants, such

as Roses in pots, when watered continually with this water, did not thrive as they should. The analysis of the water was as follows :—

	Grains per gallon.
Total solid residue	14.56
Oxygen absorbed by organic matter . . . . .	.11
Lime	2.80
Magnesia . . . . .	.91
Sulphuric acid	1.87
Nitric acid as nitrates	None
Chlorine	2.38
Equal to chloride of sodium	3.92

It will be seen from the above that neither lime nor magnesia was present in sufficient quantity to lead to the belief that the water would have any injurious effects upon plants generally. The water contained no free acid, nor were iron salts present in any excess, and I could not find any grounds for thinking that the water was one generally unsuitable for horticultural purposes.

4. *Soils*.—From the 15 samples of soil sent for analysis, a few cases are selected which presented special features.

(a) A sample of soil sent from Lingfield, Sussex, was taken from a field which was believed to be deficient in lime and to have become very poor through bad treatment. It was a rather heavy loam, passing into a yellow clay subsoil. The soil appeared to be in want of draining. The analysis of it was as follows :—

(Soil dried at 212° F.)	
Organic matter and loss on heating	5.22
Oxide of iron and alumina	6.45
Lime . . . . .	.57
Magnesia, alkalies, &c. . . . .	.59
Phosphoric acid . . . . .	.09
Insoluble siliceous matters	87.08
	<hr/>
	100.00

The great deficiency of this soil was in phosphoric acid. Of lime there was more present than had been expected. This appears to me to be a soil on which the use of basic slag would be most effective.

(b) A sample of soil was sent me by a foreign member of the Society from gardens at Delden, Holland. It was stated that plants such as Geraniums, Calceolarias, and Wallflowers did badly, but that Rhododendrons &c. grew very luxuriantly. The analysis was as follows :—

(Soil dried at 212° F.)	
Organic matter and loss on heating	6.69
Oxide of iron . . . . .	.70
Alumina	1.16
Lime . . . . .	.40
Magnesia . . . . .	.43
Potash . . . . .	.19
Soda . . . . .	.05
Phosphoric acid . . . . .	.20
Sulphuric acid . . . . .	.03
Insoluble siliceous matter and sand	90.15
	<hr/>
	100.00
	<hr/>
Nitrogen . . . . .	.277

The soil was a black sandy loam of very light character, and containing but little clay. It was practically a peaty sand. A perusal of the analysis shows it to be well supplied with vegetable matter, but that the chief wants of the soil for plants generally are lime and potash. It will be noted that magnesia was present to greater extent than lime, and this emphasizes the need for liming. That the soil succeeded well for Rhododendrons can well be understood.

(c) Two samples of soil were sent me for advice as to what was required to make them useful for forest trees. The soils gave the following results :—

(Soils dried at 212° F)		
	No. 1.	No. 2.
Organic matter and loss on heating	3'74	3'36
Oxide of iron	4'04	3'89
Alumina	2'24	2'28
Lime	'16	'13
Magnesia	'07	'13
Potash	'14	'18
Soda	'21	'11
Phosphoric acid	'28	'23
Sulphuric acid	'01	'02
Insoluble siliceous matter	89'11	89'67
	<hr/> 100'00	<hr/> 100'00
Nitrogen	'156	'130

The soils, in general composition, were very much alike, but both were extremely poor ones, showing deficiencies in vegetable matter, lime, and potash. On the other hand, they were quite well supplied with phosphoric acid. On such soils as these, no doubt, firs would do quite well, but for forest trees generally there is no question that lime would be a distinct requisite.

(d) A sample of soil was sent me for examination as regards its suitability for growing hops, and of this the analysis was :—

(Soil dried at 212° F)	
Organic matter and loss on heating	4'18
Oxide of iron	2'48
Alumina	2'01
Lime	'46
Magnesia	'33
Potash	'24
Soda	'16
Phosphoric acid	'40
Sulphuric acid	'05
Insoluble silicates and sand	89'09
	<hr/> 100'00
Nitrogen	'206

The soil was a somewhat light clay loam, and was in a good mechanical condition. Though for ordinary purposes the amount of nitrogen contained would probably be sufficient, yet for hop-growing the supply of more nitrogen by the use of shoddy or similar organic material would be distinctly advisable. In phosphoric acid the soil was decidedly well supplied, but the amount of potash would need supplementing. It would also, I think, be advisable to apply lime occasionally.

(e) In a sample of garden soil sent for analysis, the following figures as regards lime and magnesia were found :—

Lime	:	:	:	:	:	:	:27 per cent.
Magnesia	:	:	:	:	:	:	:20 „ „

In this soil lime was distinctly deficient, this deficiency being accentuated by the fact that the soil contained nearly as much magnesia as lime. In such cases, as I have had occasion to observe before, much benefit will follow the application of a good dressing of lime.

(f) A sample of soil was sent me together with roots of young vines which it was stated had been damaged, the suggestion being that some deleterious material may have been applied to the soil, and that it had injured the roots. Analysis of the soil did not point to the presence of anything which had been applied in the way suggested, but I ascertained on inquiry that large quantities of artificial manure had been used, and an examination of the soil, when washed out with water, showed it to contain excessive amounts of soluble salts, nitrates in particular being present in large excess. I was informed that a mineral manure containing nitrate of potash, nitrate of soda, and muriate of potash had been applied in February, again in May, a dressing of nitrate of soda by itself being given intermediately in April.

I cannot but think that the use of soluble forcing salts of this nature and to the extent here used must be deleterious, and that this may possibly account for the injury which was here found.

DONORS OF SEEDS, PLANTS, BOOKS, &c, TO THE SOCIETY'S
LABORATORY AND GARDEN AT WISLEY DURING THE YEAR 1914.

- ADAMS, W., Maidenhead. Melons. See p. 554.
 ADSETT, F. W., Penge. Books. Deposited in Library.
 AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA, CALCUTTA, INDIA.
 Cuttings of Plumerias and plants of Cannas.
 ALDERSEY, H, Chester. Phloxes for trial.
 ALLWOOD, Messrs., Haywards Heath. Carnations. Growing on.
 ANDREWS, R, Bickley. Improved Sprinkler. For trial.
 APPLETON, R. C., Beverley. *Rubus Schlechtendalii*. Planted in garden.
 ARKWRIGHT, Rev. E., Algiers. Winter-flowering Sweet Peas. Included in trial.
 ASTLEY, A., Ottershaw. Seed of Melon and Rhododendron
 BACKHOUSE, Messrs., York. *Saxifraga* 'Wenlock Best of All.' Planted on rockery. Melon 'Crakehall Favourite.' See p. 556.
 BAKER, W. G., Oxford. Offsets of *Haemanthus Katherinae*. Growing on.
 BALFOUR, F. R. S., Stobo. Plant of *Prunus Mira* (growing on); seeds collected by E. H. Wilson, V.M.H.
 BALLARD, E., Colwall. Asters. See p. 499.
 BARKER, Prof B. J. P., Bristol. Grafts of Apples.
 BARR, Messrs., Covent Garden. Asters (see p. 499); broccoli; Phloxes (growing on); Heleniums, Sunflowers, Rudbeckias (see p. 544); French beans (see p. 552); onions (see p. 564); tomato 'Ninety-fold'; Chrysanthemums (see p. 511); Pentstemons (see p. 276); seed of blue thistle from Kashmir (plants raised); plant setter; seeds from Nigeria (plants raised); seeds of *Chanthus puniceus* and *C. puniceus albus* (plants raised for distribution); Irises (growing on); seed of South German *Agrostis*; corms of *Freesia aurea*; (growing on); seeds of *Lupinus* from California; collection of Daffodils (planted in garden); collection of Tulips (for nomenclature trial); seeds of *Veronica Stuartii*, *Primula officinalis* var. *pannonica* (plants raised), *P. officinalis Columnae*, *Paeonia corsica* and *Fritillaria chitralensis* (sown); *Iris Taitii*. Planted in garden. Collection of Anemones and two varieties of Crocus. Planted in garden.
 BARRETT, Mrs., Maidenhead. Seed of cream Lupine. Sown.
 BARTHOLOMEW, A. C., Reading. Collection of choice seeds. Plants raised and growing on. Seeds of *Thrinax altissima*, *T. elegans* (sown), *Zanthoxylum planispinum* (sown).
 BATH, Messrs., Wisbech. Seeds of *Chionodoxa* (sown). Tulips. Included in nomenclature trial.
 BATHGATE, A., Dunedin, New Zealand. Seeds of Veronicas. Plants raised.
 BECKETT, E., V.M.H., Elstree. Pentstemons. See p. 276.
 BEES, Messrs., Saughall. *Iris Collettii*, *I. Forrestii*, *I. Bullevana*. Included in trial.
 BENNETT-POË, J. T., M.A., V.M.H., London. Narcissus bulbs. Planted in garden.
 BIJVOET, Messrs, Haarlem, Holland. Tulips. Included in nomenclature trial.
 BILNEY, W. A., J.P., Weybridge. Seeds from Patagonia.
 BIRCH, T. S. W., Ross. Seeds from South America. Sown.
 BIRD, Mrs., Esher. Red *Pulmonaria*. Planted on rockery.
 BIRKBECK, Miss A. M., Putney. Mesembryanthemums. Planted in garden.
 BLISS, E. C., West Wickham. Seed from Mexico.
 BOARD OF AGRICULTURE AND FISHERIES, London. Seed of Dakota Plum. Sown.
 BOND, Rev. C. G. O., Farnham. New species of *Calonyction*. Growing on.
 BONY, G., Clermont-Ferrand, France. Tulip 'Monsieur S. Mottet.' Planted in garden.
 BOORMAN, S., Woking. *Antennaria dioica rosea*. Planted on rockery.
 BOTTOMLEY, Prof., London. Bacterized peat. For experimental purposes.
 BOUND, W. P., Redhill. Sample of Air Orchid Fibre. For trial.
 BOWER, P., Castleford. Fruit of *Stephanotis*.
 BOWLES, E. A., M.A., F.L.S., Waltham Cross. Seed of *Aristolochia semper-virens*. Plants for rockery.

- Box, J., Lindfield. Plants for rockery. Phloxes. Included in the trial.
- BRADSHAW, Mrs., Merrow. Alpines. Planted on rockery.
- BRASSEY, Hon. Mrs. A., Chipping Norton. Cape Pelargoniums. Growing on.
- BRIGGS, H. F., Watford. Melon 'Munden Park Favourite.' See p. 559.
- BROADHEAD, Messrs., Huddersfield. Plants for rockery.
- BROOKLYN BOTANIC GARDEN, Lancaster, U.S.A. Brooklyn Botanic Garden Record. Deposited in Wisley Library.
- BROWN, J., Arbroath. Potatoes 'I is' (see p. 564.) and 'Iron Duke.'
- BROWN, Miss, Duns. Seeds and plants of hybrid *Trillium*. Sown and planted in garden.
- BRUCE & LION, Messrs., London. Pea 'Yorkshire Hero.' See p. 564.
- BUCK, C. H., Ipswich. Tomato 'Buck's Tresco.' See p. 565.
- BUNYARD, Messrs., Maidstone. Irises. Included in trial.
- CAMBRIDGE BOTANIC GARDEN. Collection of seeds. Plants raised for distribution. *Pentstemon Cobaea*. Growing on.
- CARTER, Messrs., Raynes Park. Asters (see p. 499); broccoli (included in trial); melons (see p. 554); French beans (see p. 456).
- CARTWRIGHT & GOODWIN, Messrs., Kidderminster. Asters. See p. 499. Collection of Daffodils. Planted in garden.
- CATERER, E. H., Tunbridge Wells. Celery 'Dunorlan Pink.' See p. 563.
- CHELSEA PHYSIC GARDEN. Collection of seeds. Plants raised for distribution. Cuttings of *Ribes Menziesii*, *R. scotsum*, *R. alpinum*. Planted in experiment field.
- CHILD, A., Daventry. Melon 'The Scarlet Gem.' See p. 561.
- COLOMB, Mrs. R., Kenmare. *Lobelia cardinalis*. Planted in garden.
- COMBER, J., Handcross. Plants for the garden.
- CONYBEARE, E. F., Knutsford. Arolla Pines. Planted in garden.
- COOKE, S., Glasgow. "Kilemkiw" soil sterilizer.
- COOPER & NEPHEWS, Messrs., Berkhamsted. Winter Spray Fluid. For trial.
- COW, Mrs. D., Streatham. Seeds. Sown.
- CRANFIELD, W. B., Enfield Chase. Daffodil bulbs. Planted in garden. *Primula 'The General.'* Growing on.
- CROSS, R. K., Fleet. *Oxycoccus palustris*. Planted in garden.
- CRUMP, W., V.M.H., Malvern. Carlross's Gooseberry Currant. Planted in garden.
- CUTBUSH, Messrs., Barnet. Pentstemons. See p. 276.
- DAVY, Lady, Pyrford. *Primula juliae*. Planted in garden.
- DAWKINS, A., Chelsea. Aster 'Branching Yellow' (see p. 499); miscellaneous flower seeds (see p. 549); broccoli (growing on); melons (see p. 554); Tulips (included in nomenclature trial).
- DICKSON, Messrs. A., Belfast. Dwarf bean 'Marrowfat' (see p. 552); broccoli (included in the trial).
- DICKSON, BROWN & TAIT, Messrs., Manchester. Melons. See p. 554.
- DOBBIE, Messrs., Edinburgh. Melons (see p. 554); Chrysanthemums (see p. 511); Pentstemons (see p. 276); Crocus 'Kathleen Parlow' (planted in garden).
- DOUGLAS, J., Great Bookham. Auricula. Growing on.
- DRURY, W., Woking. Cases of insects.
- DULAKE, W. T., London. Books from library of late W. Morris. Deposited in Wisley library.
- DUNEDIN BOTANIC GARDENS, New Zealand. Collection of seeds. Plants raised for distribution.
- DURHAM, F. R., Salcombe. Potatoes 'Early Lidstone' and 'Late Lidstone.' See p. 564.
- DYKES, W. R., M.A., Godalming. *Iris Forrestii*. Planted in garden.
- EARLE, Mrs., Cobham. Cotyledon (planted on rockery); cuttings of Pelargonium 'Prince of Orange' (growing on).
- EASTHAM, J. W., B.Sc., Ottawa, Canada. Collection of seeds.
- EDDY, Miss, Teignmouth. Two bulbs. Planted in garden.
- EDINBURGH BOTANIC GARDEN. Collections of Seeds. Plants raised for distribution. Seeds of *Cytisus candicans*, *C. supinus*, *Genista Villarsii* (sown). Plants of *Primula Reidi*. *Pentstemon Cobaea*.
- EDMUNDS, Mrs., Cholderton. Asparagus. Planted in garden.
- ELWES, H. J., F.R.S., F.L.S., V.M.H., Cheltenham. Collection of seeds. Sown.
- ENGELMANN, C., Safron Walden. Clips for Carnations. Sweet Pea seeds. For trial.
- EVANS, R. E., Stratford-on-Avon. Evesham Lime Sulphur, Evans' Winter Wash. For trial.
- FLEMING, Rev. Canon W. W., Portlaw. Seeds. Some plants raised.
- FLETCHER, H. M., Loughton. Seeds of *Primulas*

- FLETCHER, W. H. B., Bognor. Seeds of *Romneya Coulteri* × *R. trichocalyx*. Distributed to Fellows in 1915.
- FORBES, Messrs., Hawick. Miscellaneous flower seeds (see p. 549); Phloxes, Irises. For trial.
- FOTHERGILL, C. F., Chorley Wood. Flower press. For trial.
- FRASER, J., F.L.S., Kew. Seeds of Pelargoniums and cuttings of *P. gibbosum* and *P. 'Rollisson's Unique'*.
- FREIRE-MARREN, Miss B., Horsell. Seeds of Maize. Plants raised.
- FRUITERERS' COMPANY, London. A select list of Hardy Fruits, 1914 edition. Deposited in Wisley Library.
- GARDENER, Messrs., London. "Flexoclip" flower supports. For trial.
- GARDINER, W. H., St. Osyth. Eschscholzas. See p. 550.
- GIBSON, Messrs., Bedale. *Aconitum hybridum Gibsonii*. Planted in garden.
- GILLETT, L., Evesham. Melon. See p. 554.
- GLASHEEN, J., Hungerford. Melon 'Royal George.' See p. 554.
- GODFREY, Messrs., Exmouth. Pentstemon 'Devonian.' See p. 276.
- GOULD, A. R., Cosham. Seeds. Some plants raised.
- GREAVES, Miss, Reigate. Seeds of *Lonicera*. Sown.
- GREENAWAY, Miss A., Leatherhead. Seeds.
- GROVE, A., F.L.S., Henley-on-Thames. Seed of *Lilium regale* (plants raised). Seedlings of *Lilium elegans* var. *Wilsonii*.
- HALSEY, Mrs., Maidenhead. Seeds of Loquat. Sown.
- HAMBRO, C. E., Hayes. Plant of *Richardia*. Growing on.
- HAMMOND, Dr. W., Richmond. Lily bulbs. Planted in garden.
- HANBURY, Lady, Ventimiglia, Italy. Collection of seeds. Plants raised for distribution.
- HARKNESS, Messrs., Bedale. Verbascums. Planted in garden.
- HARRIS, A. C., Leicester. Foot scrapers for trial.
- HARRISON, Messrs., Leicester. Broccoli.
- HARTJEN, Messrs., London. Pneumatic sprayers (for trial); "Cambridge" sprayer (in use); 4 gall. pneumatic sprayer (for trial).
- HARTSHORN, A. F., Iron Bridge. Scions of Large Shropshire Damson.
- HARVEY, Mrs., Farnham. 4 vols. "Withering's Botany." Deposited in Library.
- HARVEY, Sir R., Slough. Seeds.
- HAWS, J., London. Watering cans. For trial.
- HAYWARD, P. S., Clacton-on-Sea. Pentstemons. See p. 276.
- HAZELTON, E. F., Hatfield. Melon 'Mymm's Hero.' See p. 554.
- HEINEMANN, F. C., Erfurt. Seeds of Asters (see p. 499); miscellaneous flowering plants (see p. 549).
- HOGHTON, C. A., Cobham. Stove plants. Growing on.
- HOLMES, E. M., Sevenoaks. Cuttings of Pelargoniums. Growing on.
- HOMWOOD, Mrs., Ealing. Seeds of bean. Sown. Seeds from Australia.
- HOPKINSON, Mrs., Shepperton. Collection of seeds. Some plants raised.
- HOWELL, A. M., Crowborough. Seeds from California. Sown.
- HOWLETT, Messrs., Birmingham. Porcelain labels.
- HURST, Messrs., London. Seeds of Asters (see p. 499); Pentstemons (see p. 276); broccoli (included in trial); beans (see p. 552).
- JENKIN, Dr. N. W., Hindhead. Alpines. Planted on rockery.
- JEYES' SANITARY COMPOUNDS Co., London. Nicotine Wash, Flower Wash, Summer Wash, Knapsack Sprayer, Winter Wash. For trial.
- JOHNS, R. S., West Acton. Seeds from New Zealand. Sown.
- JONES, Messrs., Lewisham. Phloxes (included in trial); Chrysanthemums. See p. 511.
- KAYE, Miss, Ascot. Books and specimens. Deposited in Wisley Library.
- KEGAN, J., A.R.C.S., B.Sc., Liverpool. Disol Fertiliser. For trial.
- KELWAY, Messrs., Langport. Pyrethrums. Included in the trial.
- KEW, Royal Botanic Gardens. Collection of seeds. Plants raised for distribution. Cuttings of Pentstemons. Growing on.
- KIRKE, Mrs., Guildford. *Aster turbinellus*. Blue. Planted in garden.
- KRELAGE, Messrs., Haarlem, Holland. Tulips. Included in nomenclature trial.
- LANGWORTHY, C., Claygate. Copy of Nehemiah Grew's "Anatomy of Plants" for Library.
- LAWRENCE, ELIZABETH Lady, Dorking. Bulbs of *Zephyranthes aurea* (distributed to Fellows); Anthuriums and Clivias (growing on); *Ribes Brocklebankii* (planted in garden).
- LAWRIE, P., Kirknewton. Potato 'Long Set.' See p. 564.
- LAWSON, F., Wallingford. Seeds of Delphiniums. Plants raised.
- LAXTON, Messrs., Bedford. Collection of Strawberries. Planted in garden.
- LEDGER, W. E., Wimbledon. *Pelargonium transvaalense*. Growing on.

- LEECH, R. B., Dulwich. Double yellow Wallflower. Planted in garden.
- LEON, Dr., Torquay. *Co'yedon californica*. Planted on rockery.
- LITTLE, Mrs., Brunnen. Orchids and blue Gentian. Growing on.
- LITTLEWOOD, Mrs., Cheltenham. Seeds. Some plants raised.
- LLEWELYN, Sir JOHN T. D., Bt., D.L., J.P., F.L.S., V.M.H., London. Plants of *Primula pseudocapitata*. Planted in garden.
- LLOYD, LAWRENCE, Messrs., London. Nozzle and connexion for "Pluviette" lawn sprinkler.
- LOAT, W. L. T., Gunnislake. Irises. Included in trial.
- LOCKWOOD, Col. Rt. Hon. Mark, C.V.O., M.P., Romford. Grafts of Apple 'Colonel's Favourite.'
- LUCAS, C. J., Horsham. *Leptospermum Nichollii*, *L. Nairnii*, Pará Rubber plant, blue Solanum (all growing on); cutting of Evodia.
- LYONS BOTANIC GARDEN, France. Collection of seeds. Plants raised for distribution.
- McBEAN, Dr. B., Ealing. Collection of Cacti. Growing on.
- McDOUGALL, Messrs., Manchester. 'Katakilla' Powder; Insecticide Wash; Insecticide Fumers; 'Celerite' Slug Destroyer.
- MAGOR, E. J. P., St. Tudy, R.S.O., Cornwall. Seedlings of *Cistus vaginatus*; *Azalea indica firma* (Forrest); *Rosa* 10843 (Forrest); *Jasminum* 11472 (Forrest); *Urtis* 10402 (Forrest); *Cornus* sp.; *Clematis* sp.; *Ligustrum* 11611 (Forrest). All growing on.
- MARSHALL, C., Horsham. Melon. See p. 554.
- MARYON-WILSON, Miss, Blackheath. *Ornithogalum pyramidale*. Planted in garden. Seeds from Queensland (sown); of creeper from India (sown); from British E Africa.
- MAUNDER, J. E., Warkworth. *Primula denticulata*. Planted on rockery.
- MAY, Messrs., Chingford. Ericas. Growing on.
- MILLER, G. W., Wisbech. Two trees of Pear 'Grey Friars.' Planted in garden.
- MILLS, Dr. H. H., Kensington. Seed of abnormal Scabious. Sown.
- MORRIS, Sir DANIEL, K C M G., M A, D Sc, D C L., F.L.S., V.M.H., Boscombe. Seeds of *Echium Perezii* and *E. Pininana*.
- MORRIS, S., Norwich. Plants for garden.
- MORTIMER, S., Farnham. Melon 'Acquisition.' See p. 554.
- MOSS, Mrs., Fleet. Copies of R.H.S. Journal for the Library.
- MOUL, Mrs. D., Woldingham. Plant for garden.
- NAPIER, Sir W., D.C.L., Farnham. Collection of seeds. Sown.
- NEIGHBOUR, W., Chiswick. Apple and Pear trees. Added to collection.
- NEVILL, Mrs., London. Flower seeds.
- NEWTON-KING, Miss, Slough. Bulbs of *Gagea Liotardii*, plant of *Primula elatior*.
- NUNN, Messrs., Inchture. Sample of "Biferroine." For trial.
- NUTTING, Messrs., London. Dwarf beans (see p. 552); broccoli (growing on); Melon 'John Massey' (see p. 554); Pea 'William Richardson' (see p. 564).
- OLIVER, Mrs. A., London. Mauve Iris. Planted in garden.
- PAUL, F. F., Botley. Sweet Peas (winter-flowering). Included in trial.
- PAYN, H., Droitwich. *Solanum muricatum*. Growing on.
- PEACHEY, H. G., Upper Tooting. Books for Library.
- PEARSON, Messrs., Lowdham. Tulip bulbs. Included in nomenclature trial.
- PERKIN & CAPENER, Messrs. Natural Organic Manure. For trial.
- PERRY, A., Enfield. *Schizocodon ilicifolia*, *Iris minuta*. Planted in garden. Irises. Included in trial.
- PETERS, W., Leatherhead. Potato 'William Peters' (see p. 564); Aster 'Joan Sturgis' and A. 'Dorothy Sturgis' (see p. 499).
- PFITZER, W., Stuttgart, Germany. Phloxes (included in the trial); Pentstemons (see p. 276); French beans (see p. 552).
- PHILPOTT, S. W., Holmwood. *Saxifraga Cotyledon*. Planted in garden.
- PICKERING, S. U., Ridgmont, Beds. Grafts of Apples.
- POLLARD, H. B., Evesham. Plants of *Helianthus multiflorus* 'H. B. Pollard.' See p. 546.
- PRAEGER, R., Dublin. Sedums. Planted on the rockery.
- PRICE'S PATENT CANDLE CO., Battersea. Liquid Gishurst Compound. For trial.
- PURCHAS, Rev. A. B., Buntingford. *Salvia verticillata*. Growing on.
- PURDIE, D. G., Glasgow. Seed of *Poinciana regia*.
- PURSER, Messrs., Birmingham. Peerless Syringe, Bucket Sprayer, Lawn Sprinkler. For trial.
- REID, Miss, Chigwell Row. Seedlings of *Primula pulverulenta*.
- REUSS, L., Woking. Alpines. Planted on rockery.
- RICHARDS, G. H., London. Richards' Worm Killer, XL ALL Grub Killer, XL ALL Nicotine Fumigating Shreds, XL ALL Winter Wash. For trial.

- RICHARDSON, G., London. Daffodil bulbs. Planted in garden.
- RICHARDSON, H. L. S., LL D., Sanderstead. Seeds from Malabar.
- ROBINSON, Messrs., West Bromwich. Powder Blower, Improved Alpha Sprayer, Carmona Winter Wash, and Improved Scalp. For trial.
- ROSS of BLADENSBURG, Lieut.-Col. Sir John, K.C.B., K.C.V.O., Rostrevor. Collection of seeds. Sown and partly distributed to Fellows.
- ROTHSCHILD, LEOPOLD DE, C.V.O., Acton. Water Lilies. Planted in the ponds.
- ROWLANDS, Messrs., Wavertree. Tulips. Included in nomenclature trial.
- RUYS, B., Dedemsvaart, Holland. Phloxes (growing on); Helennums (see p. 541).
- SAHARANPUR BOTANIC GARDENS, India. Plums. Planted in garden.
- SANDEMAN, Col. J. G., M.V.O., Havant. Seeds. Sown.
- SANDER, Messrs., St. Albans. Collection of Dendrobiums and a specimen plant of *Laelia autumnalis atro-rubens*. Growing on.
- SARGENT, C., Battle. Potato 'Sargent's Seedling.'
- SAYERS, A. F., London. Pink Violet. Planted on rockery.
- SCHOBERTS, Messrs., London. Paraffin Emulsion. For trial.
- SCHWIND, Mrs., Ealing. *Diosma ericoides*, &c. Growing on.
- SCRAPE-DICKINS, C., Horsham. Gladiolus corms. To be planted 1915.
- SELTER, A. E. C., Holyhead. Seeds of *Oenothera*.
- SHINGLAR, S. R., Ipswich. Fertilizer for Roses and Carnations.
- SIBPUR BOTANIC GARDEN, India. Collection of seeds. Sown.
- SIMPSON, Messrs., Birmingham. Asters (see p. 499); broccoli (growing on); Chrysanthemums (see p. 511); Pentstemons (see p. 276).
- SINGLETON, J., Preston. Watering-can and lawn spray. For trial.
- SMAIL, Mrs., Hayes. *Trichomanes radicans*. Planted in garden.
- SMITH, J., Chipping Norton. Melon seeds. See p. 554.
- SMITH, Messrs., Woodbridge. Pentstemon 'Kingston Beauty'. See p. 276.
- SPENCER, T., Ross. Melon 'Goodrich Seedling.' See p. 554.
- STANFORD, W., Horncastle. Strawberry plants. Planted in garden.
- STARF, Messrs., Great Ryburgh. Sweet peas. To be grown 1915.
- STERN, F. C., Goring by Sea. Yellow Clematis plants. Growing on.
- STOKES, W., London. Seeds of Oleander and Cotton. Sown.
- STRATHALLAN, Viscountess, London. Bulbs from Tenerife. Planted in garden.
- SUMMERS, G., Rotherham. Broccoli 'Hughes' Dwarf Late White'.
- SUTTON, Messrs., Gomersal. Winter Green Oil Insecticide. For trial.
- SUTTON, Messrs., Reading. Miscellaneous flower seeds (see p. 549); dwarf beans (see p. 552); Melons (see p. 554); broccoli, leeks, onions, sweet peas.
- SYDENHAM, Messrs., Birmingham. Asters (see p. 499); dwarf beans (see p. 552); broccoli; Melon 'The Countess' (see p. 554).
- TERRY, Mrs., Guildford. Plants for rockery.
- THE ACME CHEMICAL CO., Tonbridge. Acme Winter Wash, Soluble Paraffin. For trial.
- THE ARBOLINE SYNDICATE, London. Sample of "Arboline." For trial.
- THE BOUNDARY CHEMICAL CO., Liverpool. "Lichenite" Winter Wash for trial.
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- THURLOW, Major E. H., Uckfield. *Arundinaria anceps*. Planted in garden.
- TIDY, A., Cobham. Melon. See p. 554.
- TOPHAM, Mrs., Pentrich, Natal. Seed of Stapelia. Sown.
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- TRIER, F., Denmark Hill. Cypress tree. Planted in garden.
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- VEITCH, Messrs. R., Exeter. Melons (see p. 554); Broccoli; dwarf French beans (see p. 552); miscellaneous vegetables (see p. 563); Asters (see p. 499); miscellaneous flowering plants (see p. 549), Irises (included in trial); Chrysanthemum 'Pluie d'Argent.' See p. 511.
- VEREKER, G. M., Salcombe. Seedlings of Taxonia. Growing on.
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- WELLS, Messrs., Merstham. Chrysanthemums. See p. 511.
- WELLS, W. J., Merstham. Phloxes. Growing on.
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- YATES, S., Manchester. Seed of Broccoli. For trial.
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- YOUNG, E., Bromley. Melon. See p. 554.

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BOOK REVIEWS.

"The Banana, its Cultivation, Distribution, and Commercial Uses." By William Fawcett, B.Sc. With an introduction by Sir Daniel Morris, K.C.M.G., D.Sc., D.C.L., F.L.S. (8vo. xi + 287 pp. ; illustrations. Duckworth, London, 1913.) 7s. 6d. net.

It is to the invention of the system of cold storage that the enormous growth of the banana industry is due. Fifty years ago, we are told by Sir Daniel Morris in his introduction to this book, the value of the fruit exported from Jamaica was £728 ; now the value is more than a million and a half sterling. Jamaica, however, is only one of the countries engaged in this important industry, large quantities of fruit being also exported from the Canary Islands and Central and South America. The result of this is that the banana is now one of the most familiar of tropical products in north temperate countries.

The author, who writes from personal experience of the subject, gained as Director of Public Gardens and Plantations in Jamaica, gives a very full account of the plants (*Musa* spp.) from which this important fruit is derived, and deals fully with the methods of propagation and cultivation, and also with the soils and fertilizers found most suitable to this crop, and the fungus diseases and insect pests to which it is liable. The methods of transporting the fruit both by land and sea are described, and perhaps few are familiar with the amount of care and attention which is necessary in order to bring the fruit from the grower to the consumer in the best possible condition.

The chapter dealing with bananas as food will interest the general reader, as will also the account of the various manufactured products derived from bananas, such as alcohol, and banana flour.

A general review of the cultivation of bananas and allied plants throughout the tropics occupies some nine chapters, and although only a few of the countries export the banana, its importance as a native food crop is evident. The plants related to the banana are also described ; these include the " Traveller's Tree " (*Ravenala madagascariensis* and *R. guianensis*), the Strelitzias, one species of which (*S. Regina*.) is frequently cultivated in hot-houses for the sake of its gorgeous and remarkable flowers, to which the common name " bird of paradise flowers " is applied ; the " Wild Plantain " (*Heliconia Bihai*) is also sometimes grown in hot-houses, especially the two forms *aureo-striata* and *rubricaulis*, on account of their handsome foliage. The concise classification and descriptions of the species of *Musa* with which the book concludes will be useful for reference purposes.

The book is published under the auspices of the West India Committee ; it is well printed and contains some excellent illustrations, and is furnished with a complete index.

"Farm Accounts." By C. S. Orwin. 8vo. 209 pp. (Cambridge Univ. Press, London, 1914.) 3s. net.

It has been said that a greater number of farmers fail through lack of proper book-keeping than from any other cause, and probably the statement is not greatly in error. Few people need to keep books more carefully than the farmer, for his business is a many-sided one and its financial success depends upon a thorough knowledge of the cost of production. Farm book-keeping has usually, at its best, been an adaptation of shop book-keeping, and the author has endeavoured to show how it may be done with the special needs of the farm in view, and points out the method of valuation on a sound basis. The book is, of course, intended for farmers, but market gardeners will find hints of considerable value in it, and we commend it to them.

"A Book of Simple Gardening, especially adapted for Schools." By Dorothy Lowe. 8vo. 92 pp. (University Press, Cambridge, 1914.) 2s. net.

On the title-page it is said that this book is "especially adapted for schools." It would seem to us, however, to be more suitable for young amateur gardeners, some of whom might peruse it with advantage.

"The Beginner's Garden Book. A Text-book for the Upper Grammar Grades." By Allen French. 8vo. 402 pp. (Macmillan, New York, 1914.) 4s. 6d. net.

Written at Concord, Massachusetts, this book was intended to be primarily a text-book of gardening for use in connexion with schools in the United States. It covers not only school gardening, however, but also the work of gardening at home. In the nature of things it contains much that is not applicable to the English school garden, but the way in which some of the lessons are dealt with should prove suggestive to teachers.

"A Monograph of the genus *Sabicea*." By Herbert Fuller Wernham, B.Sc., F.L.S., Assistant in the Department of Botany. 8vo. 82 pp., with 12 plates and text-figures. (British Museum (Natural History), 1914.) 6s. net.

We understand that since the publication of this work, which is, we think, its author's first independent volume, he has received his Doctor's degree from the University of London. We do not know whether this masterly little monograph was a thesis for this degree; but in any case we can congratulate the University on the work of its alumnus, and the Museum Trustees on the enlightened policy that has led to its publication. For the purposes of his work Dr. Wernham has visited the herbaria of Paris, Geneva, Brussels, and Madrid, with the assistance of a grant from the Trustees, and has also examined the materials available at Berlin, Stockholm, Cambridge, and Kew.

To a genus of tropical Rubiaceae, of which some forty species had been described, he has added sixty-five. The whole 105 species are here described in good technical Latin, according to the requirements of our existing International rules, under a grouping in two subgenera, the latter divided into three sections, devised by the author. This occupies fifty pages of the slim volume ; but purely descriptive botany, especially when it deals with an unknown genus of no ascertained economic import, has as a rule absolutely no interest for the general public, and even the botanist puts it aside among books of reference. Dr. Wernham, however, in less than twenty pages of Introduction has invested his subject with the most profound biological importance, so as to arrest the attention of any thoughtful student of plant history or geography. Not only has he given us a full history of our knowledge of the genus, an excellent clavis to the species, a list of the collectors of the herbarium material, and an account of the distribution and critical characters of the various types, but he has correlated structure, habit, affinity, and distribution in a manner which should serve as a model to other monographers. The Rubiaceae are a large, mainly tropical, but widely-spread family, gamopetalous and mostly insect-pollinated, and thus presumably of comparatively recent origin, geologically speaking. Most of the species of *Sabicea* are, Dr. Wernham tells us, climbers of a most primitive type, scrambling, without hooks, tendrils, or any special devices, over the river-banks or other scrub of the tropical forest. A few of them have, however, migrated into the open savannah and become erect bushes, and among these are the whole five Madagascar species, four at least of which are closely related offshoots from the near kin of the East African *S. arborea* K. Schum. The great majority of the species are West African ; but there is what has been termed a secondary centre of dispersal in Western Tropical South America. Dr. Wernham has drawn up a most suggestive diagram, showing the early divergence of the African and American stocks, his Section *Capitatae* being almost exclusively African and the *Sessiles* almost exclusively American. The exceptions are apparently interesting examples of what Hewett Watson described as Convergence. The anomaly—and such anomalies are of the utmost importance to the phytogeographer—is *S. umbrosa* Wernham, from Colombia, the one representative in the New World of the East African subgenus *Stipulariopsis*.

“ British Orchids : How to tell One from Another.” By Colonel J. S. E. Mackenzie. Illustrated by Miss C. E. Talbot Ponsonby. 4to. 40 pp., with 10 coloured plates. (Unwin Brothers, London, 1914.) 5s. net.

A conservative estimate would reckon some forty-three species of British orchids, though Colonel Mackenzie only speaks of thirty-six. Of these, eleven are figured in Miss Ponsonby's mostly excellent plates. These plates are mounted on tinted paper, and the book is beautifully printed and tastefully bound in buckram, so that it is

cheap at five shillings. Colonel Mackenzie has arranged thirty-six species in ten "classes" of his own contriving, based upon characters of the spur, leaves, and inflorescence. The sole professed object of this scheme is to find out the name of any species with ease, which we have not found to be achieved by it. The author's knowledge of the plants may be gauged by his remark that "the only difference between" *Gymnadenia conopsea* and *Orchis pyramidalis* is that "one has a sweet smell, the other a nasty smell." Two concluding pages are devoted to the "Meaning of Botanical Names," in which *apifera* is explained as "L. 'Api,' a bee; 'fera,' bearer," and *conopsea*, *Morio*, and other by no means abstruse terms are left with a query. It is a pity that Miss Ponsonby's skill has not been employed upon a more complete and really useful text. It is a common delusion that sound knowledge can be obtained without taking pains.

"Productive Orchardng : Modern Methods of Growing and Marketing Fruit." By Fred C. Sears, M.S. 8vo. 315 pp. (Lippincott, Philadelphia and London, 1914.) 6s. net.

This work is one of a type which has now become frequent in America, and deals with the whole subject of commercial fruit-growing from the selection of the site up to the latest developments of marketing. The last twenty years in England have seen many American practices adopted in this country, and there is not, therefore, very much that will be new to fruit-growers here, either in cultural methods or in the combating of pests.

The author opens with a discussion on the prospects of fruit culture and the possibilities of over-production, and it is rather remarkable to read that the production of apples in the United States has progressively declined since 1895.

Under the discussion of soils some very valuable particulars are quoted from H. J. Wilder as to the various types of soils best suited for certain varieties of apples, and it is interesting to note that these preferences are very largely based on mechanical differences, a point which opens up some problems. Another factor of great importance in the States is the question of temperature, but this seems to be quite secondary in this case. Should these facts be well established, they form an interesting commentary on the supposed influence of certain stocks.

A chapter is devoted to the question of interplanting with a view to removal as the permanent trees require the whole ground, and it seems that in the United States, as in this country, the chief difficulty is for growers to bring themselves to the point of sacrificing profitable trees for the benefit of the orchard in the long run, and the author very strongly leans to vegetables rather than to bush fruits for this purpose.

A striking point in American commercial orchards is the absence of grass beneath the trees for grazing, as is so commonly seen in this country, and the whole tendency seems to be more and more for

cultivation and for trees on lower stems, such as are called bushes in England. An alternative to the use of grass is the planting of cover crops. They are recommended for several reasons, amongst which the following are the most important. On sloping lands they serve to hold the water, preventing the soil from being washed away. They check the autumn growth by limiting the water supply, and finally add a considerable amount of humus to the soil. When such cover crops are of leguminous plants a certain proportion of nitrogen is, of course, added as well. The plants most generally used for this purpose are various Clovers, Vetches, Rape, Barley, Rye, and Soy Beans.

The usual pests, both insect and fungus, are figured and described, but we do not note any new methods of treatment. It is unfortunate that the Latin names of these are not given, as, though a "railroad worm" may be recognized at once on the other side of the Atlantic its identity here is by no means certain.

It is useful to note that experiments have been tried as to the danger to cattle of the arsenical spray which falls on grass when the trees are being sprayed in spring. Such grass was cut and given to horses, and cattle were also grazed under the trees, with no harmful effect. Furthermore, the small amount of arsenic which sometimes remains in the calyx of apples has been proved to be so insignificant that eight or ten barrels of fruit might be eaten without any ill effect.

It is also interesting to learn that in the Western States thinning of the fruit on the trees is practised and is considered commercially successful, and the author strongly advocates its adoption in the Eastern sections, with which his book is particularly concerned.

Upon the oft-debated question of gathering in bags or baskets, the author still believes in a padded basket, and the new apparatus, which resembles a cross between a pail and a sack, he does not consider advisable save in extremely careful hands.

The question of storage is dealt with rather fully, and its value as enabling the grower to hold his fruit should prices be unfavourable is very strongly emphasized. The importance of a certain amount of moisture is very strongly advocated for the successful keeping of fruit, and it is stated that one of the most successful stores has a stream of water always running through it.

The whole work is written in the cheery tone which one expects from America, and it is well printed and illustrated. Unfortunately, these illustrations have necessitated the adoption of a heavy clay-laden paper, and the book is therefore somewhat unpleasantly heavy to hold in the hand.

"Transpiration and the Ascent of Sap in Plants." By H. H. Dixon, Sc.D., F.R.S. 8vo. 216 pp. (Macmillan, London, 1914.) 5s. net.

This work contains eleven chapters. The first deals with *The Nature of Transpiration*, but it is remarkable that the author entirely omits to say anything about the *cause* of it. All botanists are aware that it is *light*, and not *heat*, which is the agent; and, as Henslow has

proved, that the red and violet rays always give maxima, the green rays being the most inefficient. Hence all experiments devoted to loss of water by *heat* will not apply to transpiration, but to *evaporation*. They are clearly distinguishable on very hot days, when lettuces wilt, though the light is the same as on a bright, cool day. Hence, we do not quite see why transpiration is to be regarded as "a physical phenomenon" (p. 5); for it ceases as soon as the protoplasm is dead, and evaporation alone occurs.

A considerable portion of the book is concerned with refuting other theories; while chapter 4 deals with the *Cohesion Theory of the Ascent of Sap in Trees*. As far as *capillarity* and *cohesion* water in tubes of a very small bore are concerned, there is nothing new in this itself. If a tube ($\frac{1}{4}$ inch diam.) be placed in water, one end being stopped, and it be drawn out vertically, the water will not flow out at the base. Hence, when water has been drawn up by root-pressure into the tubular vessels of the wood to 10–15 metres (according to Sachs, "Phys.," p. 275), then, as long as transpiration goes on, the water will be presumably drawn up *above* the limiting height of root-pressure, which keeps the stem supplied. But we fail to see how "cohesion" can cause the water to rise. As there is no exposure to the air, as in the barometer, atmospheric pressure is excluded.

The author's own words are:—"Cohesion Theory.—This assumes that the water in the conducting tracts of high trees hangs there by virtue of its cohesion . . . The adhesion of water to the walls of the tracheæ we have shown to be very great," &c. (p. 87), but the actual *cause of movement*, other than transpiration withdrawing it from the tracheæ in the leaves, does not seem to be clearly expressed. He adds: "Atmospheric pressure can supply the evaporating cell at most only up to a level of about 10·3 metres." But, the tracheæ being closed at both ends, how can the atmosphere assist in the process? He proceeds: "It follows that the water in the tracheæ above this level is at all times in tension." But, still, what provides for the continuous flow of water to supply the enormous loss of water of a large leafy tree on a sunny summer day?

There is a feature in xerophytic plants which may throw light upon the question. They are often characterized by possessing water-storage tissues, such as the pseudo-bulbs (swollen internodes) of epiphytic orchids. In some desert plants, certain groups of large cells round the vascular bundles are filled with water; or it may be the cortex, or roots, &c. Now all this water can be utilized in prolonged seasons of drought. How is it passed into the tracheæ? Presumably it follows exhaustion by contraction of the cells by their elasticity. Now, what is excessive in cases like these may act normally in ordinary trees and herbs. The cellular tissues, *i.e.* pith, cortex, and medullary rays, are all filled with water, derived from the *excess* over transpiration, supplied by root-pressure, capillarity, and tension. Transpiration ceases at night, but the supply never stops. Will not any exhaustion in the tracheæ be at once met by the elasticity of the turgid

cells at once pouring it out into them? The fact is recorded by Sachs that the more external the tissues of a stem are the greater is their tension, while the pith is under the greatest contraction, so that when the zones are freed by vertical sections the superficial tissues contract while the pith expands; hence these would seem to be just the conditions for the water-bearing cells to discharge their supply into the tracheæ when transpiration is in excess.

With regard to the question: What causes the sap to rise above the height to which root-pressure can carry it? the explanation by the author is given in the following words: "*Raising the Sap by Evaporation.*—Under certain conditions, when evaporation from the transpiring cells removes water faster than their secretory powers can provide it, the menisci formed in the substance of their walls must support the tensile columns of water in the plant. Evaporation from these menisci must provide the traction to raise the water. The tension is transmitted downwards through the roots to the absorbing cells. In these cells the actions which occur must be the converse of those occurring in the mesophyll. At the root the entry of water depends on the gradient of pressure on passing from the outside of the root to the inside of the tracheæ. The fall of pressure due to the tension in the water is continuous all the way up the stem to the leaf. Thus we may regard the flow of water up the highest tree as due to the evaporation and condensation produced by the difference between the vapour pressure in the soil spaces and that obtaining round the leaves. The column of tensile water flows, under the action of this difference, from end to end of the plant." (Pp. 203-4.)

"Gardening for Beginners." By E. T. Cook. 8vo. 650 pp. ("Country Life." London, 1914.) 12s. 6d. net.

We have reviewed this excellent work before, and the fact that it has now run into its sixth edition speaks for itself of its usefulness and popularity. Mr. F. W. Harvey has added chapters on the Heath Garden, the Wall Garden, the Bog Garden, Replanting or Renovating Borders, &c., as well as a large number of new illustrations, amounting to about 250, with plans, diagrams, and coloured plates, thus dealing with every form of gardening, and making the book a treasury of information, given in a pleasing style, and so that the whole is easily understood.

"The Garden under Glass." By William F. Rowles. 8vo. 368 pp. (Richards, London, 1914.) 6s. net.

However capable a man may be, it is quite impossible to deal fully with such a vast subject as gardening under glass in a volume of this size, but as it is written for amateurs the leading points of culture of fruit, flowers, foliage plants, bedding plants, propagation, forcing &c., the construction of glass erections, and the principal plant pests and diseases are dealt with as fully as space will permit. It is essentially an amateur's book, is well written, boldly printed, and contains numerous illustrations and diagrams.

"The Practical Garden-Book." By C. E. Horn and L. H. Bailey. 8vo. 250 pp. 8th edition. (Macmillan, London and New York, 1913.) 2s. net.

Though written for American readers chiefly, this is a most valuable book to all gardeners, as it deals with subjects usually overlooked, viz. "common things and simple garden operations, which most books take for granted." As the matter is in alphabetical order, there is no index.

"Sweet Peas for Profit." By J. Harrison Dick. (A. T. De La Mare Publishing Co., New York, 1914.) \$1.50.

Mr. Harrison Dick was editor of the "Journal of Horticulture" until a few years ago, when he went to New York to edit "The Florists' Exchange." He has produced in his new surroundings a most interesting book on Sweet Peas for profit. The sub-title is "A practical guide to modern methods of growing the Sweet Pea for market purposes." Naturally, the greater portion of the book is devoted to cultivation under glass, which is now of so much importance in the United States that Sweet Peas rank third in importance in most districts with florists, following Roses and Carnations.

Cost of growing, market returns, and profits are systematically dealt with, and there is a very practical chapter on house-construction and heating. Cultural details are very fully given—soil preparation, sowing, temperature, ventilation, watering, and feeding are all treated in a plain and workmanlike fashion.

When the writer comes to gathering the blooms we disagree. He advises pulling with a sharp upward pull, instead of cutting with either knife or scissors. We have tried the former, but never with success.

There is a chapter on raising new varieties, and one explaining the best English methods of culture in the open air.

The work is well printed and very well illustrated. We are in hearty agreement with the writer when he expresses the opinion that the Spencer forms have entirely eclipsed the old forms for garden culture, and will presently eclipse them for under glass work also. It is interesting to note that Australia has recently come into the field as a raiser of early or winter-blooming Sweet Peas, and that one variety, "Yarrawa," has already made a great name for itself.

One comes across many trite sayings. Here are two: "Growers who send flowers of inferior grade to market are doing themselves, the Sweet Pea, the salesman and the public combined an injustice."—"One sincerely hopes that raisers of new kinds will not perpetuate scentless varieties."

The book is advertised at 1 dollar 50 cents, post free, which is much higher in price than a similar work would sell for in England.

"Trees and Shrubs Hardy in the British Isles." By W. J. Bean. 2 vols. 8vo. xiv + 688 + vi + 736 pp. (Murray, London, 1914.) £2 2s. net.

The woody vegetation of the temperate regions of the world has long been a source of attraction to the ardent horticulturist, for trees and shrubs give a permanent setting to the garden; many are very beautiful in themselves, either for their form, their foliage in the changing seasons of the year, their flowers, or their fruits; and apart from this there is a peculiar attraction about a well-grown tree, a sense of steadfastness and sturdy strength, or of enduring delicacy and grace that must appeal to almost all garden lovers. Loudon's monumental industry provided an extraordinarily valuable account of trees and shrubs introduced to these islands up to the date of its publication (1838) in "*Arboretum et Fruticetum Britannicum*," while the magnificent work on trees recently completed by Elwes and Henry has given to British horticulturists and foresters a work of reference concerning trees altogether invaluable. Shrubs were, however, beyond the scope of the latter book, and the explorations in China, especially those of Wilson for plants of horticultural value, and the recent introduction of shrubby plants from other temperate regions have made Loudon's valuable work quite out of date. When we remember the skill Loudon had in packing much information into small space, and remember also that his book extended to four thick volumes of letterpress besides four of plates, it will be recognized at once that the two bulky volumes of this new work will not altogether supersede Loudon's, but they supplement it and give an account of all the more reliable and valuable of the woody plants now cultivated in the gardens of these islands.

Mr. Bean has had unique opportunities at Kew for becoming thoroughly acquainted with the subjects with which he deals, and he has made the best use of them; besides this he has travelled, and has used his powers of observation in such a manner as to enable him to give us a most valuable book.

The plan of it, after some useful preliminary matter dealing with cultural operations and the horticultural uses of trees and shrubs, is to take each genus (in alphabetical order) and describe it, give notes upon the cultivation of the species, their propagation and the like, and then to describe the species in cultivation. In cases where, as so often happens, confusion exists as to the correct names of garden plants, the particular distinguishing characteristics between the confused plants are carefully pointed out, notes on hardiness, synonymy, and so on, given, and notable examples alluded to. Where a good figure exists reference is made to it, and the excellent line drawings in the text, made from photographs by Miss E. Goldring, are valuable aids to identification. There are also a number of good full-page plates from photographs of plants in gardens. We wish, however, that fuller synonymy had been given in some cases. For instance,

that plant of many names, *Spiraea canescens*, is only credited with one synonym, *S. flagelliformis*, yet catalogues and books refer to it by many another.

In spite of the intrinsic interest and beauty of many of the shrubs and trees hardy in this country, they are far less well known than they should be, and when they are planted they are far too often permitted to become overgrown and so neglected that the term "shrubby" is apt to conjure up a picture of tangled lilacs or greedy laurels, with here and there a derelict *Euonymus*—a dank, neglected spot, such as ought to exist in no garden. It can only be from ignorance of the wealth of shrubs of great beauty that are in cultivation that such spots are to be found, and we hope that the publication of this valuable book will open the eyes of many to the possibilities that are at their hand for making gardens of permanent interest and lasting beauty.

"The Rose Annual." 1914. Edited by the Hon. Secretary. 8vo. 224 pp. (E. Mawley, Berkhamsted.) Free to members of the N.R.S.; non-members 2s. 6d.

The "Rose Annual" for 1914 forms a volume very similar in size and appearance to its predecessors. Like them it contains numerous articles by rosarians dealing with Rose-growing in its various aspects, not only in the British Isles, but in France, China, and other places.

The volume opens with an interesting account of M. Jules Graveraux's celebrated Rose Garden at L'Hay, near Paris, which has the additional interest of being written by the owner of the Garden. M. Graveraux has succeeded in collecting here some 7500 varieties, and though there are some 12,000 names of Roses known, he is probably correct in saying that a large number of them are mere names, and that there can hardly be many more Roses in existence than those which have found their way into the rosary at L'Hay. It is at all events the most complete collection in the world, embracing, as it does, not merely the garden varieties, but a large number of botanical species and forms.

Two subjects are this year chosen for special treatment: (1) the classification of Roses and (2) the diseases mildew and black spot, and to both these discussions several writers have contributed.

In the revival of Rose-growing which took place at the beginning of the nineteenth century rosarians were content to follow the botanical classification of the genus; but, as Darwin long ago pointed out, the Rose lends itself with peculiar facility to the formation of new groups, but the work of the hybridizer has been so continuous and he has worked in so many directions that many new groups of garden Roses have arisen which not only merge into one another, but seem to cut across the old lines of botanical differences, and in the result the modern system of classification of Garden Roses has become

elaborate and complex, and to some rosarians rather unsatisfactory. It is easy to say that we desire a simpler and more useful arrangement which will give more complete information as to the members of the Roses in the different classes. It is a more difficult thing to devise a scheme that will satisfy these requirements. How far the nine writers who have attempted to find a solution of the difficulty have succeeded in their object is a question on which opinion is likely to differ and which the future must decide.

There can be little doubt of the increasing eagerness among Rose-growers to find a method of dealing satisfactorily with fungus disease. Whether this arises from the increase in the number of Roses grown in this country, or from any decrease in vitality and hardness of constitution of our modern Roses, or again from the fact that these diseases occur chiefly in late summer and early autumn, and the great development of autumn Roses causes us to expect to enjoy our Rose gardens at a time of the year when formerly they were less interesting than we now expect to find them, or from some other cause, there can be little doubt that if these diseases could be banished the appearance of our autumn Rose gardens would improve. The subject is treated by several writers of practical experience in the treatment of Roses, and it may be that success will ultimately be found to lie in the domain of the preventive medicine of the Rose.

Though these two subjects are the most elaborately treated, there are several readable articles on other matters of perhaps more general interest, *e.g.* on the lasting qualities of cut Roses, on the production of new varieties, on budding Roses and other like topics. The volume concludes with Mr. Mawley's well-known Rose analysis for the previous year, which he has now compiled for many years in succession, giving the position of the different varieties as measured by their success at the different exhibitions of the Society.

"A History of Botany, in the United Kingdom, from the Earliest Times to the End of the Nineteenth Century." By T. Reynolds Green, Sc. D., F.R.S. 8vo., 648 pp. (Dent, London, 1914.) 10s. 6d. net.

This valuable work, issued after the author's lamented death, is most fascinating to read, and will long remain the standard work on the subject, which the author has so admirably treated. The important Index contributed by Miss M. Knight, M.Sc., will be found to supply not only the name of every botanist of note from the sixteenth to the twentieth century, but a most important "Chronological Table" of their works. The whole book comprises some 650 pages.

It contains six "Books" entitled "Early Botany and the Herbalists"; "The Rise of System" (Ray, Morison, and Grew); "Ray to the Linnean System"; "Ascendency of the Linnean System"; "The Revival of the Natural System"; "Lindley to Darwin"; "The Origin of the Modern Revival"; "The Wave of Progress."

It would be impossible to give details of the work of each of the many botanists mentioned ; but in every case it appears to be admirably and concisely expressed, for Green had thoroughly grasped his subject and treated it in a most masterly way.

" Plant Life : Addresses given at the Early Morning Adult Schools, Birmingham." With 130 Illustrations. By T. H. Russell, F.L.S. 1a. 8vo. 71 pp. (Cornish, Birmingham, 1913.) 2s. 6d. net.

It contains five lectures on the root, stem and branches, leaves, flower and fruit. Each was issued separately at 1d. each (the book being 2s. 6d.). The illustrations (photographs and drawings) are mostly good, but that of the " Root Hairs " is not equal to the rest. The descriptions of the parts of plants are almost entirely morphological, but occasionally the late author dealt with the uses of structures. These might have been more developed.

A few inaccuracies may be noticed. The section of an *entire* grain of wheat is called the " Wheat Embryo." Ivy roots do not require crannies, for they climb up a flat brick wall. The illustration given is of a shoot which was *not* attached, the roots having grown out straight. Why plants with " trailing stems," as *Ranunculus repens*, should belong to the " earlier forms of vegetable life " is not stated, &c. Otherwise the descriptions are plain and simple, and adapted to children.

" A Guide to Rose Culture in the Bombay Presidency." By G. B. Patwardhan, B.Sc. 8vo., 45 pp. (Bulletin of the Agri-Horticultural Society of Western India, No. 7, 1914.) 1 rupee 8 annas.

A little book, which is designed to instruct the good people of Bombay how to grow the Rose.

We gather that the Rose is grown there at present chiefly in pots, and the author is doubtless right in suggesting that growing them in the open ground will be found more satisfactory, in that ground plants maintain a supply of blossoms over a longer period than pot plants.

The early part of the book gives directions for propagation and cultivation, which on the whole are satisfactory, though some of the headings are treated very shortly ; e.g. the chapter on pruning is rather summarily dismissed with little but a couple of quotations.

Over the matter of classification, however, the writer comes badly to grief, and his list of varieties is one we should consider in this country quite out of date. We have noticed no reference to any *Wichuraiana* or multiflora hybrids, or the *Polyantha* pompons or the *Pernetian* hybrids, and barely half a dozen H.T.'s are named. Then it is curious to find 'La France' and 'Captain Christy' placed among the H.P.'s, while 'Frau Karl Druschki' and 'Xavier Olibo' are put among the Teas !

" The Coconut." By Edwin Bingham Copeland. 8vo., xiv + 212 pp., with illustrations. (Macmillan, London, 1914.) 10s. net.

The importance of the coconut in modern commerce is indicated by the number of books which have recently appeared dealing with this subject, either in a general way or in one or other of its many

aspects. The present volume was written in the Philippines, where the author is Professor of Plant Physiology and Dean of the College of Agriculture, and it is largely an account of the coconut industry in those islands. The information is, however, not only of local importance, but of value wherever the coconut is grown; for, as the author correctly states, a knowledge of the physiology of the palm is essential to a correct understanding of its behaviour, and the physiology of the tree is the same all the world over. Much of the information is based on original observations made by the author or his students, and the methods of cultivation recommended are those usually followed on modern estates. The subject of diseases and pests is very fully dealt with, and a rather formidable list of injurious insects is furnished, but fortunately only a few of the pests mentioned do any serious damage to healthy trees. The preparation of copra and the methods of extracting oil are also explained so far as the practice on plantations is concerned, but the author does not discuss at any length the numerous and varied uses of coconut products. The book is clearly printed in generous type, and contains some excellent illustrations; the information is concise and to the point, and should prove of value to those intending to undertake this branch of tropical agriculture.

"Maize: Its History, Cultivation, Handling, and Uses, with special reference to South Africa." By Joseph Burt-Davy, F.L.S., F.R.C.S. 8vo., xl + 831 pp., with illustrations. (Longmans, London, 1914.) 25s. net.

In this bulky volume the subject of maize is treated exhaustively from many points of view, and the work may be considered a most important contribution to agricultural literature. The importance of maize as a food crop is, perhaps, scarcely realized in this country, where climatic conditions are such that maize cannot be grown except as green fodder; and it is with some surprise that one learns that maize heads the list of cereals and that the quantity annually produced in the world reaches the extraordinary total of 3,875,927,000 bushels, as against 3,428,998,000 bushels of wheat. Of this enormous output, 75 per cent. is grown in the United States, where the domestic consumption per capita is 25.5 bushels, which, it is said, is the heaviest rate of consumption of any cereal by any people in the world. Although such enormous quantities are grown in the United States, America is not a large exporting country, as nearly every maize-grower finds it more profitable to turn the major part of his crop into beef or pork before it is sold. A certain amount is also eaten as a green vegetable, while some is ground into "corn meal" for domestic use, so that there is little surplus available for export. The largest and best single market for maize is the United Kingdom, which annually absorbs something like 30,000,000 muids, valued at £15,000,000, or nearly as much as that taken by the whole of continental Europe. Most of the import comes from South America. Besides being used for stock and poultry feeding, maize is an important

item in the manufacture of whisky and gin, beer, starch, glucose, &c., and also enters into foodstuffs for human consumption. Manufacturers are also constantly finding new uses for maize, and the demand is steadily increasing. In the writer's opinion South Africa is an ideal country for the production of the maize crop for the supply of the European market, and already there are good grounds for the prophecy that South Africa will one day be the "maize granary of Europe." The climatic conditions of a large part of the Orange River Colony, Transvaal, Natal, Rhodesia, Basutoland, Swaziland, and the Transkei are said to be all that could be desired for maize-growing. The crop is already the favourite of the South African Kaffir, and maize has become an important item in the diet of the white population, so that a good local market already exists. It is estimated that with improved methods of cultivation the Transvaal alone should be able to produce, without difficulty, some 35,000,000 muids a year, which would give a substantial margin for export purposes.

As Government Agrostologist and Botanist in the Union of South Africa Department of Agriculture, the author has had much to do with the breeding and improvement of maize varieties, of which a large number exist, and also with the judging of samples shown at exhibitions, and the information he gives relating to these aspects of the subject will be found of great interest and of wide application. The cultivation, marketing, and milling of maize are fully dealt with, as are also the preservation and use of maize stover, hay, and silage as stock foods. The use of maize products in the arts and manufactures provides material for an interesting chapter with which the book concludes. Amongst other manufactures and products derived from the maize plant, mention is made of starch, glucose, dextrine, corn-oil, glycerine, sugar, alcohol, cellulose, rubber filler, paper, mats, hats, charcoal, tobacco-pipes, fire-lighters, gunpowder, and medicines.

Appended to the volume is a very full and valuable bibliography, and a useful index.

The work is dedicated to General Botha, Prime Minister of the Union of South Africa and Minister for Agriculture, "in appreciation of his efforts to develop the maize industry."

"Trees and How they Grow." By G. C. Nuttall, B.Sc. Illustrated with 15 autochromes by H. E. Cooke, F.R.P.S., and 186 photographs by the Author. 8vo., 184 pp. (Cassell, London, 1913.) 6s. net.

The student of our trees and shrubs will find this a most useful book, in that the illustrations and descriptions leave nothing to be desired in the matter of ready recognition. Indeed, amongst the many books that have been published on the subject we consider the present one of the best, and must congratulate the author on the concise and masterly way he has treated his subject. Twenty-four of our commonly cultivated trees and larger growing shrubs are dealt with, the text being illustrated by about one hundred and fifty beautifully executed plates of the various species, which of themselves

will render recognition unusually simple. But this is not all, for the life-history of each tree, from the seedling to the matured timber, has been carefully worked out, and in a remarkably interesting and accurate way.

We can confidently recommend the book to all who take an interest in the history and development of our commonly cultivated trees and shrubs.

"Trees in Winter, their Study, Planting, Care, and Identification." By A. F. Blakeslee, Ph.D., and C. D. Jarvis, Ph.D. 8vo., 446 pp. (Macmillan, New York and London, 1913.) 8s. 6d. net.

The title, unfortunately, gives but a partial idea of the scope and usefulness of this book, which in reality is an excellent résumé of the propagation, planting, and general care of trees—their study and identification being also well attended to. Even the enemies of trees have received attention in the matter of insect and fungus pests, with the best means of eradication; while injuries brought about by gas fumes, neglected pruning, and from various other causes, are all dealt with.

The illustrations, too, are numerous and well executed, and will greatly aid the text. Though American methods connected with tree management are somewhat different from what is considered orthodox in this country, yet the advice is sound, and such chapters as those devoted to planting, pruning, and selection of trees for special purposes are of great value, and contain a large amount of useful information to the planter.

There is an excellent chapter on town planting, from which much may be learnt regarding the management of trees in our public streets and squares, and also the accidents and diseases to which trees so situated are liable. The identification of trees both from illustrations and letterpress leaves little to be desired, while taken as a whole the work will be a distinctly useful one, and is to be recommended.

"Cocoa." By Dr. C. J. J. van Hall, Director of the Institute for Plant Diseases and Cultures, Buitenzorg, Java. 8vo. xvi + 515 pp. With illustrations and map. (Macmillan, London, 1914.) 14s. net.

The cultivation of cocoa has become such an important industry of recent years, especially in some of the colonies within the British Empire, that a comprehensive work on the subject by such a competent authority as Dr. van Hall is particularly welcome. Although the existence of the cocoa plant was known in Europe in the early part of the sixteenth century, and its products were introduced into Spain in the latter part of the same century, it was not till after 1828, when van Houten had discovered a method of making cocoa powder by eliminating most of the fat or cocoa-butter from the seeds, that cocoa came into general use as a beverage. This is illustrated by the fact that in 1822 the consumption of cocoa in England was only 523,000 lb., whilst in 1909 it was 88,133,000 lb.

England, however, is not the greatest cocoa consumer ; that distinction belongs to the United States, which is followed by Germany and France, and fourthly by England.

Some twenty species are known of the cocoa-tree genus (*Theobroma*), but only two are of importance as producers of commercial cocoa, namely, *Theobroma Cacao* and *T. pentagona*. The botanical characteristics of these species are fully described and illustrated in this book, as are also the numerous local types and varieties found in cultivation. Then follow chapters describing the most approved methods of cultivation, but in this connexion the author is careful to point out that too much reliance should not be placed on experience gained in one particular country, as in all probability it will not be applicable elsewhere, and in any case it is always advisable to study local methods and to adopt them as far as possible. The various processes that the seed has to undergo for the market are next fully described, and the methods in vogue in different countries are discussed. That section of the book dealing with diseases and pests of the cocoa-tree is, as one would expect of the author, very full, and the information given should prove of much value to the planter.

In a review of the cocoa-planting industry in all the countries concerned, the methods of cultivation and preparation of cocoa peculiar to the different countries are given and commented on.

The concluding chapter briefly relates the more important facts concerning the manufacture of cocoa and chocolate, but the book being primarily intended for the planter this part of the subject is outside its scope. Although the author insists that planting work must be learned in the field, there is much information in this handbook which should prove of use to the planter, as the *reason why* is stated for each of the methods described. The full descriptions of the numerous varieties of cocoa and the excellent photographic illustrations should further make the book a valuable work of reference.

"Adventures among Wild Flowers." By John Trevena. 8vo. 304 pp. (Arnold, London, 1914.) 7s. 6d. net.

This is a cheerful book, full of "delight in simple things, and mirth that has no bitter springs." The adventures are not of a stirring or dangerous nature. Italian peasants and the life of Alpine villages and hostelries provide most of them, but they are so delightfully related that they outshine the wild flowers themselves.

Botanical criticism is disarmed by a statement at the close of the second chapter, addressed to those about to accompany the author on his rambles. "None of you are botanists," he writes. Now it is unkind to the botanist to suppose he will not enjoy the healthy fun of this book, and still more unkind to him, perhaps, to set his teeth on edge so often in the passages dealing with plants by a disregard for the fairly simple rules that govern the use of capitals in the names of plants. Extreme recklessness and variation are shown in this line, for generic names are as often as not spelt with a small letter, and specifics of

ordinary adjectival value as frequently promoted to the glory of a capital—so much so, indeed, that the lists of names resemble the exercises in lesson-books in which the student is invited to note and correct the errors. At last one feels it may be a pose of the author, a pretence to a lack of orthodox botanical knowledge, a stooping to conquer, to encourage the non-botanist, who is so unfairly considered the only worthy companion to share in the joys of this book.

Yet the eye of a botanical friend on the proofs, or a comparison of the names with those in the Kew Hand-lists of Shrubs and of Herbaceous Plants, would have rendered the book delightful to all, even to the driest of botanists. May there shortly appear a second edition in which the species of *Dianthus* now appearing as *Barbatus*, *Deltoides*, *Graniticus*, and *Caesius* will resume their customary small letters; *Daphne striata* will no longer be declared identical with the far more lovely and good-tempered plant *D. Cneorum*; the charming picture of *Viola calcarata* will no more stand on its head; and justice may be done on p. 172 to the excellent collections of native and local plants shown in many botanic and public gardens, as, for instance, at Cambridge and Cheltenham. Then one may laugh at that lifelike character Baron Cow's Tail and the episode of the disappearing Drops of Brandy; be grateful for the recipe for beds of closely-packed stones and soil as a substitute for the so-called moraine; and delight in the beautiful little prose poem on *Eritrichium nanum* at home; without shuddering at the slight put upon the memory of Caspar Wistar in the word printed 'wisteria.'

One more pious hope: may there be a good index! The sixteen photographs that form the illustrations are by Mr. Reginald Malby, and a sufficient guarantee for their excellence is embodied in the bare statement.

"Myths and Legends of Flowers, Trees, Fruits, and Plants, in all Ages and in all Climes." By Charles M. Skinner. 8vo. 302 pp. (Lippincott, Philadelphia and London, 1913.) 6s. net.

The folk-lore of plants has been so well dealt with already that, having such books as Folkard's and Friend's, one would think there was no need for another on the subject. However, the American book under notice is written in such a pleasant, light-hearted way, that it gives the tales already told by the others in a very attractive and cheerful form, and has a further claim to a space on the shelf through containing several additional legends, especially those of American and Japanese origin.

Of the former a singularly charming one tells how the aged Peboan, the Winter spirit, dying of age and cold, is visited by Segun, the beautiful spirit of Summer, whose breath causes flowers to spring forth and the shaking of whose hair brings warm, gentle rains.

As Peboan dies his furs turn to frozen leaves, but Segun warms them to life, and places them in the earth as the lovely and sweetly scented Trailing Arbutus, *Epigeia repens*, that the children may find

the blossoms and know that Segun has been there and Peboan has gone away.

Other interesting additions to collected plant-legends may be found in the inclusion of Longfellow's pretty tale of "The Bell of Atri" under the subject Bryony, the origin of the Cotton pod, Maize, Indian Plume, the Maguey (Agave), Alligator's Tail, and Micah Rood's blood-stained apples, which last seem to be akin to the old-fashioned kind known as Sops-in-wine.

It is a pity that most of the plants are mentioned under their popular names only, and in some cases it is difficult to identify them. The author is wrong in stating that Holly is a corrupted form of the word "holy," for it is but the equivalent of the old English holecn, hollen, holn, and holme, which last we still use in the name Holm-oak for the Evergreen Oak. The spelling of generic names with a small letter is a trick that is very annoying to the eye of an English botanist. Then again Camelia, Escholzia and Wisteria, and Æi for aei need correction in spelling. Rosemary is not "fond of the water" but of very dry places on the coast, and therefore was thought to rejoice in sea-spray or sea-dew, *ros maris* or *ros marinus*. It strikes one as exceedingly American to find Ivy dealt with under the heading of "The Vines," but it must surely have been an accident while in the printer's hands that has suppressed the heading "Betel" and caused the account of its nuts to be joined on to that of the Beech, even in this the second edition. Still the book is good enough to deserve a third edition and the righting of these wrongs.

"Saxifrages or Rockfoils." By Walter Irving and Reginald A. Malby. 8vo., 147 pp. (Headley, London, 1914.) 2s. 6d. net.

Two such authorities on Saxifrages as Messrs. Irving and Malby might be expected to produce a really useful book on the subject, and in this expectation nobody reading it will be disappointed.

Saxifrages are arranged under their groups, and a description given of each. The cultural directions given by these experienced hands are, in the main, all that could be wished, one's only complaint being that they might have been a little amplified with advantage. One would have been glad, for instance, to have had the authors' experiences of the cultural needs of Englerias. Sunny positions are recommended, but in the reviewer's experience *Griesbachii* does better in half shade, and the same is also true of all the *Burseriana* hybrids.

There is an extremely useful chapter on Saxifrage hybrids, and a charming chapter by Dr. Salter on the species found in the Pyrenees.

A word of praise must be given to the illustrations, and altogether the book is one which no rock gardener interested in Saxifrages can afford to be without.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with much appreciation. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* renders subsequent reference to the original easy. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.
2. To place next the name, when given, of the author of the original article.
3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 609, 610.
4. After this, a reference to the number, date, and page of the journal in question.
5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
IN THIS WORK.

Baker, F. J., A.R.C.S., F.R.H.S.
 Ballard, E., F.R.H.S.
 Bowles, E. A., M.A., F.L.S., F.E.S., F.R.H.S.
 Brennan, A., B.Sc., F.R.H.S.
 Bunyard, E. A., F.L.S., F.R.H.S.
 Cavers, Prof. F., D.Sc., F.R.H.S.
 Cayley, D. M., F.R.H.S.
 Chittenden, F. J., F.L.S., F.R.H.S.
 Clayton, C. P., F.R.H.S.
 Cotton, A. D., F.L.S.
 Darlington, H. R., F.R.H.S.
 Druery, C. T., V.M.H., F.L.S., F.R.H.S.
 Dykes, W. R., M.A., F.R.H.S.
 Farmer, Professor J. B., M.A., D.Sc., F.R.S., F.R.H.S.
 Groom, Professor Percy, M.A., D.Sc., F.L.S., F.R.H.S.
 Henslow, Rev. Professor Geo., M.A., F.L.S., F.R.H.S., V.M.H.
 Hodgson, M. L., F.R.H.S.
 Hooper, Cecil H., M.R.A.C., F.R.H.S.
 Horne, A. S., D.Sc., F.G.S., F.L.S., F.R.H.S.
 Houston, D., F.L.S., F.R.H.S.
 Jeffery, Violet G., F.R.H.S.
 Kerridge, Rev. A. A., M.A., F.R.H.S.
 Long, C. H., F.R.H.S.
 Massee, Geo., F.L.S., F.R.H.S., V.M.H.
 Newstead, Professor R., A.L.S., F.E.S., F.R.S., F.R.H.S.
 Pethybridge, G. H., B.Sc., Ph.D., F.R.H.S.
 Petts, Alger, F.R.H.S.
 Rendle, A. B., M.A., D.Sc., F.L.S., F.R.S., F.R.H.S.
 Reuthe, G., F.R.H.S.
 Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
 Simmonds, A., F.R.H.S.
 Smith, William G., B.Sc., Ph.D., F.R.H.S.
 Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
 Voss, W. A., F.C.S., F.R.H.S.
 Webster, A. D., F.R.H.S.
 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales . . .	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope . . .	Agr. Jour. Cape G.H.
Annales Agronomiques . . .	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault . . .	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort. . .	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles . . .	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg . . .	Ann. Jard. Bot. Buit.
Annals of Botany . . .	Ann. Bot.
Beih. zum Botanischen Centralblatt . . .	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura . . .	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana . . .	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticultura . . .	Boll. R. Soc. Tosc. Ort.
Botanical Gazette . . .	Bot. Gaz.
Botanical Magazine . . .	Bot. Mag.
Bulletin de la Société Botanique de France . . .	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret . . .	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France . . .	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane . . .	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne . . .	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica . . .	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad . . .	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations . . .	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie . . .	Cent. f. Bact.
Chronique Orchidéenne . . .	Chron. Orch.
Comptes Rendus . . .	Comp. Rend.
Contributions from U.S.A. Herbarium . . .	Contr. fr U.S.A. Herb.
Department of Agriculture, Victoria . . .	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand . . .	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées . . .	Dict. Icon. Orch.
Die Gartenwelt . . .	Die Gart.
Engler's Botanische Jahrbücher . . .	Eng. Bot. Jah.
Gardeners' Chronicle . . .	Gard. Chron.
Gardeners' Magazine . . .	Gard. Mag.
Gartenflora . . .	Gartenflora.
Journal de la Société Nationale d'Horticulture de France . . .	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture Victoria . . .	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies . . .	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research . . .	Jour. Agr. Research.
Journal of Agricultural Science . . .	Jour. Agr. Sci.
Journal of Botany . . .	Jour. Bot.
Journal of Chemical Society . . .	Jour. Chem. Soc.
Journal of Ecology . . .	Jour. Ecol.
Journal of Economic Biology . . .	Jour. Econ. Biol.
Journal of Economic Entomology . . .	Jour. Econ. Entom.
Journal of Genetics . . .	Jour. Gen.
Journal of the Board of Agriculture . . .	Jour. Bd. Agr.
Journal of the Linnean Society . . .	Jour. Linn. Soc.
Journal of the Royal Agricultural Society . . .	Jour. R.A.S.
Journal of the Society of Chemical Industry . . .	Jour. Soc. Chem. Ind.
Journal S.E. Agricultural College, Wye . . .	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte . . .	Kais. Ges.
La Pomologie Française . . .	Pom. Franç.
Le Jardin . . .	Le Jard.

610 JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY.

Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr *
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form

NOTES AND ABSTRACTS.

Acid-tolerant Crops for Acid Soils. By F. V. Coville (*U.S.A. Hort. Soc., Illinois, Trans.* 1913, pp. 184-196).—This is a study in the adaptability of certain crops to acid soils. In the pine barrens of New Jersey, which are a wilderness of soil acidity, blueberry plants grow with the greatest luxuriance and bear fruit in prodigious abundance. In the early experiments with blueberries it was found that these plants grew successfully in certain acid soils composed chiefly of partially-rotted oak leaves. When, however, some five-year-old oak leaf-mould was substituted for the partially-rotted oak leaves the growth of the blueberries dwindled almost to nothing. Further study of the decaying leaves of various trees disclosed the facts that when freshly fallen they are exceedingly acid, that as decay proceeds this acidity lessens and then disappears, and that, finally, in the black leaf-mould stage the chemical reaction becomes alkaline. As showing the acidity of freshly-fallen leaves it is estimated that a compact layer 6 inches in depth, estimated to weigh when dry 500,000 lb. an acre, would require from 14 to 25 tons of ground limestone an acre to neutralize its acidity, while rye, red clover, alfalfa, and cow-peas, in the fresh state in which they are ploughed under when used for green-manuring purposes, would require from 9 to 13 tons. The rate at which different kinds of leaves pass from the acid to the alkaline stage varies very much, maple taking in some cases only a year, while oak leaves take several, but the rate for green-manuring plants has not yet been determined.

As nitrifying bacteria do not thrive in acid media, the way in which plants growing in acid soils obtain their nitrogen is an interesting problem. The blueberry bears upon its roots a fungus the threads of which penetrate the living interior of the root tissue. While the experimental results cannot as yet be regarded as furnishing an absolute proof, the evidence strongly indicates that the fungus takes up organic nitrogen from the abundant supply existing in the peat, and delivers it to the plant in some available form. These mycorrhizal fungi exist on the roots of many wild plants on the peat formation.

Between the two extremes of acid-loving plants and those requiring alkalinity, such as alfalfa and red clover, there are fortunately a certain number of agricultural plants which may be described as acid-tolerant, and they are said to include the strawberry, blackberry, and American red raspberry among fruits, the sweet potato and carrot among roots, and rye, buckwheat, and millet among grains, while

redtop grass does very well indeed in acid soils. For green-manuring on such soils there are at least two leguminous plants available, the cow-pea and hairy vetch, and, under certain conditions, the soy bean and crimson clover.

The writer emphasizes what is now recognized as the best agricultural practice, namely, that lime in any form to be effective requires to be applied in a finely divided state and very intimately and thoroughly mixed with the soil. He describes an experiment in which he grew some seedling blueberry plants in pots and watered them with nothing but lime-water for seven months, at the end of which time they had grown from $4\frac{1}{2}$ to 14 inches in height, the lime apparently having no deterrent effect upon them. An examination of the soil showed that the surface was covered with a hard grey crust of lime, the soil for half an inch below this containing no blueberry roots, and a chemical test showing it to be impregnated with lime. Below this the soil was full of roots and still gave the acid reaction that was characteristic of the whole before the lime-water application began.

A. P.

Afforestation Scheme of the Leeds City Council, Washburn Valley. By A. Pope (*Quart. Jour. of Forestry*, No. 3, vol. viii., pp. 190-207; July 1914).—The valley originally formed part of the Royal Hunting Forest of Knaresborough, and about 1086 A.D., when the Domesday Survey was made, the owner was the King. In the Middle Ages, the forest was thickly wooded, but during the reign of Queen Elizabeth iron smelting was extensively carried on, which (historians state) caused the destruction of the timber in the forest, and by the year 1700 few trees were left.

The district was enclosed under Act of Parliament passed in 1770. Allotments were granted to various persons, and some of the land broken up and cultivated.

Thirty to fifty acres of new land surrounding the reservoirs are now planted annually, together with replanting and filling up on the land planted, by the "unemployed," and up to the present 853 acres have been planted with 3,400,000 trees. The species planted chiefly are :—Oak, beech, larch, Scots pine, alder, black Italian poplar, wych elm, birch, sycamore, Japanese larch, Corsican pine, Norway and Sitka spruce, while Douglas fir, lime, Austrian pine, silver fir, white American spruce, hornbeam, and others are being planted on a small scale for experimental purposes.—A. D. W.

Algaroba. By W. M. Carne (*Agr. Gaz. N.S.W.* vol. xxv. p. 419).—The seeds of the Algaroba or Mosquito Bean germinate with difficulty. Chipping the beans aids germination.—S. E. W.

Ammonia, Fixation of, in Liquid Manure (*Agr. Gaz. N.S.W.*, vol. xxv. p. 144).—The loss of ammonia from the liquid collected from stables and cattle-sheds can be prevented by the addition of powdered gypsum.—S. E. W.

Ammonia Gas as a Fumigant. By D. E. Fink (*Jour. Econ. Entom.* vii. p. 149; Feb. 1914).—Ammonia gas was found to be an efficient fumigant for killing pea seed beetle when the seeds were contained in small bags. Three oz. of strong ammonia was allowed to evaporate in a box of about 9 cubic ft. capacity. No particulars of the effect of the gas on the seeds are given.—*F. J. C.*

Apple Black-rot, Control of. By F. A. Wolf (*Phytopathology*, iii. pp. 288-289; Dec. 1913).—The author considers removal of mummy apples attacked by *Sphaeropsis malorum*, the cause of apple black-rot, ploughing in of leaves in autumn, and two sprayings with 3-3-50 Bordeaux mixture effective in controlling this disease.—*F. J. C.*

Apple-blossom Blight, an Unusual Outbreak. By G. M. Reed (*Phytopathology*, iv. p. 27; February 1914).—Notes are given of a very severe outbreak of blossom blight due to *Bacillus amylovorus*, in which the varieties 'Ben Davis,' 'Gano,' 'Early Harvest,' and 'Ontario' proved quite free; 'Ingram,' 'Melonen,' 'Jeneton,' 'Devonshire Duke,' and 'Stayman Winesap' were all badly attacked, practically all the clusters of leaves and flowers dying and turning brown.—*F. J. C.*

Apple, Cedar Rust of the. By Dr. M. B. Waite (*U.S.A. Hort. Soc., Virginia, Rep.* 1913, pp. 37-56).—A popular study of the life-history of this fungus. It seems to be gradually adapting itself to one variety after another, and to be increasing in its severity at a very rapid rate where the red cedar is in proximity to apple orchards. The cutting down of red cedar trees within a mile of the orchard is still the only satisfactory way of combating the disease, though in a season with only one short infection period some excellent results have been obtained from a spraying just ahead of this period. See abstract on "Apple Trees and Cedar Rust" in the *R.H.S. JOURNAL*, vol. xxxix. p. 762.—*A. P.*

Apple 'King David.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 385, 1914; col. pl.).—An improved 'Jonathan' found in a hedgerow in Washington County and considered of great promise.—*E. A. Bd.*

Apple-sucker and Leaf-curling Plum Aphis, Spraying for. By F. R. Petherbridge (*Jour. Bd. Agr.* xxi. p. 915; Jan. 1915).—Reports the results of spraying with various grades of lime-sulphur in the early spring in a badly-infested orchard. The author considers that the application of lime-salt and sulphur wash as late as possible previous to the hatching of the *Psylla* eggs is a good preventive measure, but that spraying before the middle of March is of little service.—*F. J. C.*

Apple 'White Winter Calville.' By Echtermann (*Gartenflora*, vol. lxiii. pp. 246-251; 2 plates).—'White Winter Calville' bears remunerative crops when grown as a cordon against a wall protected from spring frosts by linen screens at flowering time. The trees are planted in a mixture of sandy loam, chalk, basic slag, and well-rotted horse-dung in a well-drained situation. Every year a top dressing is given consisting of 4 ounces of potash salts to each tree, in addition to a liberal supply of farmyard manure. The trees are sprayed with Bordeaux mixture early in February, before the buds open, and again when the fruit begins to set. Large crops are grown in Dahlem, and sold in Berlin, as French Winter Calvilles.—S. E. W'.

Apples, Experiments in Dusting and Spraying. By F. M. Blodgett (*U.S.A. Exp. Stn., Cornell, Bull.* 340, 1914; figs.).—Experiments in the application of insecticides in a finely-ground dry form as against the spraying method. The tests are not yet completed, but the author considers that the "dry way" is a promising method.—E. A. Bd.

Apples, Packing Indiana. By W. R. Palmer (*U.S.A. Exp. Stn., Purdue, Circ.* 39, 1914; figs.).—Concise directions for packing this fruit in boxes, with a copy of the Sulzer Bill.—E. A. Bd.

Arabis attacked by Fungus. By R. Laubert (*Gartenflora*, vol. lxiii. pp. 303, 304).—When *Arabis* is attacked by white rust (*Cystopus candidus*) pale-yellow spots appear on the leaves and a white powder is found on the under-surface. No remedy has been found for the disease, so the plants should be destroyed. Shepherd's Purse (*Capsella Bursa-pastoris*) acts as a host for this fungus, consequently it should not be allowed to grow in a flower garden.—S. E. W.

Araucaria, Cone and Fertilization of. By L. Lancelot Burlingame (*Bot. Gaz.* lvii. pp. 490-508, June 1914; 3 plates and 2 figs.).—The cones of *A. brasiliensis* shed their seeds in autumn or winter when approximately two years old. Of the 400-500 spore leaves not more than one in twenty is fertile, and many ovules fail to mature; all the cones are abundantly pollinated.—G. F. S. E.

Arsenate of Lead as an Insecticide, Powdered. By W. E. Hinds (*Jour. Econ. Entom.* vi. p. 477; Dec. 1913).—Reports the successful use of arsenate of lead in the form of a powder, applied as a dust spray. The men employed in applying it were in no way injured.—F. J. C.

Arsenate of Lead, Some Properties of various Forms of. By J. A. Dew (*Jour. Econ. Entom.* vii. pp. 162-167; April 1914).—Three forms of lead arsenate are on the market: the acid salt (PbHAsO_4) (33 per cent. arsenic oxide), the neutral ($\text{Pb}_3(\text{AsO}_4)_2$) (25 to 27 per cent. arsenic oxide), and the basic containing an excess of the base (20 per cent. arsenic oxide). Experiments show that the efficiency of

the spray depends upon the percentage of arsenic present, but that the amount of fruit caused to drop through the spraying depends upon the form used rather than upon the amount of arsenic present, the acid form being the worst.—*F. J. C.*

Bamboos, Climbing. By Miss Agnes Chase (*Bot. Gaz.* lviii. pp. 277-279, Sept. 1914; 1 plate).—Gives some interesting field notes on *Arihrostylidium* and other climbing bamboos of Porto Rico. *A. sarmentosum* is "a most airy, graceful, delicately beautiful species, the long, slender vine-like culms, with their clusters of pale-green foliage festooning the trees, or hanging free from the long limbs above a trail or rivulet and suggesting a lacy veil." This species is exceptional in the stems dying down each year. The author found it in full flower on Dec. 2, 1913.

A. multispicatum has the slender, naked, growing ends of the culms beset with short, sharp prickles. These long grappling branches swing in the breeze like a whip-lash until they strike a hold. These branches are freely produced, and form an inextricably entangled mass that draws blood at every step of one's progress through it.—*G. F. S. E.*

Black Spot on the Mandarin (*Agr. Gaz. N.S.W.* vol. xxv. p. 684).—When a Mandarin orchard is attacked by black spot, the trees should undergo a drastic pruning. Immediately after pruning, the trees and soil beneath must be sprayed with Bordeaux or lime-sulphur mixture, also after the fruit sets, and again a fortnight later.—*S. E. W.*

Bordeaux Mixture, The Action of, on Plants. By B. T. P. Barker and C. T. Gimingham (*Ann. Appl. Biol.* i. pp. 9-21; May 1914; figs.).—In connexion with investigations into the action of Bordeaux mixture, observations, which are here recounted, have been made upon spray injury or "scorching" by Bordeaux mixtures and the penetration of copper from Bordeaux mixtures into the plant. The authors found that cells with readily permeable walls, such as the germ tubes of fungus spores, root hairs, the interior tissues of leaves, &c., exert a considerable solvent action on the particles of copper compounds with which they come into contact. The dissolved copper is rapidly absorbed and the cells killed, such action, in the case of injured foliage, resulting in scorching. The extent of interaction between copper compounds and other types of cells depends upon the nature of the cell wall. Direct absorption of copper by leaves of certain types takes place with or without local injury, and may have a marked effect upon the colour of the foliage. Potatoes, beans, and other plants also absorb copper by their roots with local injury to them, and the absorbed copper can be translocated to the aerial parts of the plants without injury to the cells through which it passes.—*F. J. C.*

Botanic Gardens at Rio de Janeiro. By R. C. McLean (*New Phyt.* vol. xii. Nos. 9-10, pp. 336-342).—The author gives a brief but interesting description of the large botanic gardens at Rio de Janeiro, and of the forest and other types of vegetation in the

neighbouring parts of Brazil. The gardens have apparently suffered considerably from past neglect, but during the short time that Dr. Willis has been in office as Director great improvements have been effected. Adjoining the gardens there is a forested slope which has been taken over by the Brazilian Government for the cultivation of useful trees, but the work of clearing parts of the area for this purpose is evidently a difficult one, for wherever the trees are felled the lianas and climbing bamboos multiply and make an almost impenetrable jungle, so that in many respects the gardens and their vicinity are still of perhaps greater interest to the ecologist than to the economic botanist. The extraordinary richness of the flora in and around Rio is shown by the fact that no fewer than 11,000 species are known from the Federal Area in which the city is situated, an area of about the same extent as the County of London and largely covered by buildings. Though forest trees predominate in the gardens themselves, there are open spaces where European and tropical flowers flourish bedded side by side as in an English park, but the great features are the palm avenues, the bamboo plantations, fine groups of the huge Musaceous *Ravenala madagascariensis*, very fine collections of Cycads and Conifers, sections devoted to families like Aroideae and Marantaceae, and a large pond of Pontederiaceae and other tropical aquatics.—F. C.

Brown-rot Fungus, A Study of the. By J. L. Conel (*Phytopathology*, iv. p. 93; April 1914).—The brown-rot dealt with is said to be *Sclerotinia cinerea*, not *S. fructigena*, producing the rot mainly on stone fruits, but occurring also on pome fruits. The conidia found on the mummy fruits survive the winter in many cases. Infection experiments were carried out, and while plums were very readily infected, apples were also attacked, but less vigorously.—F. J. C.

Carbon Supply to Garden Plants. By H. Fischer (*Gartenflora*, vol. lxiii. pp. 125-132).—A new series of experiments shows that the addition of carbonic acid to the atmosphere not only assists the growth of plants, but also induces them to flower earlier and more freely. This confirms the author's previous results. Increased crops were also obtained in the open, when carbonic acid gas was supplied to the roots, through a system of perforated pipes, laid at a depth of 4 inches in the seed-bed. The gas was supplied to the bed every bright morning, a fortnight after the seed was sown.—S. E. W.

Catasetum. By H. Memmler (*Orchis*, vol. viii. pp. 19-23).—The varieties of *Catasetum* may be divided into four sections.

I. *Eucatasetum*. The plants are dioecious, and the labellum is inserted above the flower. The rostellum is prolonged into two antennæ. *C. atratum*, *C. Gnomus*, *C. macrocarpum*, *C. purum*, *C. macroglossum*, *C. Naso*, *C. viridiflorum*, *C. maculatum*, and *C. Wailesii* belong to this section.

II. *Myanthus*. Dioecious plants. The labellum in the male is below, and in the female above the flower. This group embraces

30-40 members. *a.* The antennæ are in different planes ; only one is sensitive. *C. pileatum*, *C. Christyanum*, *C. saccatum*, and *C. tabulare*. *b.* Antennæ in one plane, both sensitive. *C. barbatum*, *C. cernuum*, *C. Darwinianum*, *C. Garnettianum*, *C. luridum*, *C. sanguineum*, *C. callosum*, *C. Trulla*, and many others.

III. *Ecirrhosae*. Dioecious. The labellum is below the male flower ; the female flower is not known. *C. calceolatum*, *C. glaucoglossum*, *C. roseum*, *C. Russellianum*, *C. Scurra*, *C. violascens*, and *C. Warscewiczii* belong to this group.

IV. *Pseudocatasetum*. Hermaphrodite flowers, with labellum below and no antennæ. This class includes *C. discolor* and *C. longifolium*. These orchids are extremely interesting on account of the results they yield on hybridization. *C. × splendens*, a hybrid of *C. macrocarpum*, and *C. pileatum* exhibit ten different forms of flowers. They thrive in *Osmunda* fibre, or mixed *Osmunda* and *Sphagnum*.—*S. E. W.*

Cherry 'Abbesse d'Oignies.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 385, 1914 ; col. pl.).—A variety of the 'Duke' race, with the more tender flesh of the 'Montmorencies.' Much grown in Western Europe, and considered promising for the Eastern States of North America.—*E. A. Bd.*

Chestnut Blight. By F. D. Heald and M. W. Gardner (*Phytopathology*, iii. pp. 296-305 ; December 1913 ; figs.).—By an ingenious method of collecting the spores, the authors show that every winter rain washes down viable spores of the chestnut bark fungus from diseased areas, and incidentally they show that the so-called "summer spores" are very abundant during the winter also.—*F. J. C.*

Chestnut, Endothia Canker of. By P. J. Anderson and W. H. Rankin (*U.S.A. Exp. Stn., Cornell, Bull.* 347, June 1914 ; figs.).—The chestnut bark disease has proved very serious indeed in the States, and this bulletin gives a very full account of the fungus and its development, and of the measures to be adopted against it. The authors consider the fungus to be different from the European *Endothia radicalis*, and adopt Murrill's name, *E. parasitica*, for it.—*F. J. C.*

Clematis montana rubens. By G. T. Grignan (*Rev. Hort.*, June 1, 1914, pp. 245-6 ; 1 ill.).—This note strongly recommends the wider use of this very beautiful and quite hardy Clematis, owing to its free habit, abundant floescence, and bright and attractive colour. Requires plenty of water, but seems to be immune from insect attack.

C. T. D.

Coniferous Seedlings, The Damping-off of. By P. Spaulding (*Phytopathology*, iv. p. 73 ; April 1914 ; one plate).—The author concludes that damping-off of coniferous seedlings is caused by several widely-different fungi, and occurs under very different conditions in different places. Each case, therefore, requires special investigation. Soil sterilization by the use of formalin (1 oz. to 1 gallon), sulphuric

acid (1 oz. to 1 gallon), or a dilute solution of ammoniacal copper carbonate applied some little time before the sowing of the seed, was found in many cases an effective preventive of damping-off.

The use of poor seed, giving rise to weak seedlings, leads to much trouble.—*F. J. C.*

Crop, The Effect of one Growing, on Another. By the Duke of Bedford, K.G., F.R.S., and Spencer U. Pickering, M.A., F.R.S. (*Woburn, 14th Rep.*, 1914, pp. 46-50).—The authors' investigations into the effect of grass on trees are now widely known (see 3rd Rep., 1903, and 13th Rep., 1911), and an appendix to this Report (pp. 136-151) gives a brief summary of their work in this direction during a period of nearly twenty years. Recent experiments are considered to throw light upon the subject and to explain many phenomena which have hitherto been perplexing. The conclusions arrived at are that a toxic substance is formed in the soil by the growth of any plant in it, originating probably in the decomposition of the debris of roots during growth, this substance being toxic, not only to other plants of a different nature, but to the plants themselves which form it; but that, by the action of air and moisture, probably with the assistance of bacteria, this toxin becomes oxidized and converted into plant food, thus eventually rendering the soil more fertile than it would be in the absence of vegetation. This beneficial action takes due effect on any plants growing in the soil, unless these have been so injured by the previous toxic action as to be beyond recovery, as in the case of trees.

This Report also contains a communication on the subject by Dr. E. J. Russell, the Director of the Rothamsted Station (pp. 51-68). A seven years' series of pot experiments have been conducted there in which rye, buckwheat, and spinach have been grown during the whole period in the same soil, and these show that no lasting toxic effect is produced on the soil by any of the crops grown. The toxic substance produced is very unstable and soon loses its poisonous properties. The phenomenon seems to be general, being caused by all roots and affecting all plant life so far as investigation goes. Efforts to discover if the toxin is produced by some action of the roots on the soil have so far given negative results. Certain experiments at Rothamsted indicate the possibility that bacterial action may play a part in determining the injurious effects of the grass roots, for, apparently, when the experiment was carried out under rigidly aseptic conditions no harmful effects were obtained.—*A. P.*

Currants and Gooseberries, Two new Insect Pests of. By R. A. Cooley (*Jour. Econ. Entom.* vii. pp. 193-195; April 1914).—The larva of small weevil (*Pseudanthrenus validus* Dietz) was found feeding in the seeds of the currant and the tender younger parts of stems of gooseberries, and red and black currants were found to be distorted, undersized, and showing markings due to the attacks of a thrips (*Liothrips montanus*). Notes are given on the life-histories of the pests, and "Black Leaf 40" (nicotine solution) was found to be an effective spray for the latter.—*F. J. C.*

Damping-off, Preliminary Tests of Disinfectants in Controlling it in Nursery Soils. By Carl Hartley and T. C. Merrill (*Phytopathology*, iv. p. 89; April 1914).—Sulphuric acid, $\frac{1}{2}$ oz. to the square foot has given good results on soils in which pines were to be grown (the damping-off being due to *Pythium Debaryanum* and to *Fusarium* sp.), but dicotyledonous weeds on the plots appear to be badly affected by the acid. The suggestion is made that air-slaked lime should be subsequently dusted on to the treated soil to neutralize the acid where dicotyledons are to be grown subsequently.—F. J. C.

Date Palm, "Fruiting Male" of. By H. Martin Leake (*New Phyt.* vol. xiii. Nos. 1-2, pp. 69-70; 5 figs.).—The date palm is normally dioecious, but cases have been recorded of the occurrence of so-called "fruiting males"—that is, of male plants producing female flowers or inflorescences. These observations have been made on the plant when in fruit, but the writer gives details of the flowers themselves in a case which he observed at the Government Botanic Gardens at Saharanpur, Northern India, where there is a date plantation in which different varieties of date palms imported from various sources are cultivated. Among these a plant was found which bore a whole series of intermediate and hermaphrodite flowers, of which figures are given. Apparently the change is not strictly the substitution of a monœcious for a dioecious habit, as has been assumed in the previously recorded cases. It appears that in these abnormal flowers the few fruits that reach maturity are derived from the female flowers in which the stamens have been completely aborted. The condition of the hermaphrodite flowers, intermediate between the diclinous flowers, is not confined to the stamens and pistil, for correlated changes occur in the form of the perianth leaves; in one case figured the perianth segment opposite the single developed stamen retains the character of the male flower, the two remaining segments having a form approximating to that characteristic of the female flower. In previous cases of "fruiting males" the plants were found to bear clusters of small seedless dates, but the development of the flowers here described was not traced further.—F. C.

Dendrobium speciosum and D. thyrsiflorum. By W. Dobberke (*Orchis*, vol. viii. pp. 23-25; 2 plates).—Illustrations are given of the shy-blooming *Dendrobium speciosum* and of *D. thyrsiflorum* in flower.—S. E. W.

Diseases of Trees in S. Appalachians. II. By A. H. Graves (*Phytopathology*, iv. pp. 5, 63; February and April 1914; plate).—Diseases of the Scrub Pine (*Pinus virginiana*) are dealt with, descriptive notes on the following being given: Burl disease due to *Cronartium Quercus*, which has as alternate host various species of *Quercus*; heart-rot due to *Trametes Pini*; leaf-cast caused by *Gallowaya Pini*; and the rather rare attack of *Coleosporium inconspicuum*, which has

Coreopsis verticillata as its alternate host. Damage due to wind, to ice and snow, and to cultivation in unsuitable soils is also referred to.

The second paper deals with attacks upon the Spruces *Picea Abies* and *P. rubens*, and the Hemlocks *Tsuga canadensis* and *T. caroliniana*. Seedling blight of the former due to *Ascochyta piniperda*, *Sclerotinia Fuckeliana*, and *Phoma* sp.; twig blight due to a species of *Pestalozzia* similar in its effects to *P. funerea*, and to *Phoma piceana*; heart-rot due to *Trametes Pini*, and frost injury, are all dealt with. On the latter the following attacks appear to be the most important: timber-rot due to *Fomes pinicola*; leaf-rust to *Pucciniastrum Myrtilli*, which is said to have an Ericaceous plant as its alternate host; twig blight to a species of *Rosellinia*.—*F. J. C.*

Electrical Discharge, The Distribution of Overhead, Employed in recent Agricultural Experiments. By I. Jørgensen and J. F. Priestley (*Jour. Agr. Sci.* vi. pp. 337-348; September 1914).—The authors show that the incidence of the electrical discharge is by no means confined to the ground beneath the wires, but is distributed also in varying degrees, according to conditions which are continually altering, to the adjacent areas. Adjacent areas have usually acted as control areas, and the results obtained are therefore misleading. Methods of overcoming this difficulty are discussed.—*F. J. C.*

Epidendrum polybulbon var. luteo-album. By E. Miethe (*Orchis*, vol. viii. pp. 33, 34; 1 plate).—This orchid is of easy cultivation and free growth. In January it is covered with flowers, which remain open for a month. The flower segments are pale yellow, with a trace of brown at the base and the labellum is white. The plant is a native of Mexico and the West Indies. It thrives in a temperate house, in a well-lighted situation, and likes moisture.—*S. E. W.*

Erodium and Pelargonium, A Bacterial Disease of. By J. M. Lewis (*Phytopathology*, iv. pp. 221-232; August 1914; pl.).—Spots are produced on leaves of Pelargonium, at first minute and pellucid, enlarging with age, becoming reddish-brown in centre, with a colourless border, the dead tissue later becoming dry. On *Erodium texanum* the young spots are reddish-brown, but become black and somewhat watery in appearance. A bacterium has been isolated, studied, and named *Bacterium (Pseudomonas) Erodii*. It was found to produce typical spots on a large number of varieties of Pelargonium, but not upon other plants in which inoculations were tried.—*F. J. C.*

Fire Blight, Importance of Tarnished Plant Bug in the Dissemination of. By V. B. Stewart (*Phytopathology*, iii. pp. 273-276; Dec. 1913; fig.).—The author shows that *Lygus pratensis* is an active agent in carrying the bacillus of fire blight from tree to tree in nurseries.—*F. J. C.*

Fish Manure, Fish Meal and (*Jour. Bd. Agr.* vol. xxi. No. 7, pp. 688-694).—About half the article is devoted to fish manure,

which is dealt with under the sub-headings: Origin, Composition, Approximate Values based upon Manurial Constituents, Action, and Application.—A. S.

Fruit Blossom, A Bacterial Disease of. By B. T. P. Barker and O. Grove (*Ann. Appl. Biol.* i. pp. 85-97; May 1914).—The authors report a disease of bacterial origin resulting in the death and blackening of stigmas of apple and pear even before the flower opens. The organism to which the disease is attributed has been isolated and its cultural characters determined. It proves to be a species of *Pseudomonas* possibly hitherto undescribed, but of wide distribution. There are two main forms of the disease. In one the tips of the sepals first turn grey and then blacken, the blackening subsequently passing to the flower stalk and later involving the whole flower bud or even to the whole truss. The spurs are also attacked and may die out. In the other case the trouble first appears in the form of minute greyish-black spots, which increase in size and later coalesce; the entire receptacle becomes blackened, and the disease spreads to the ovary. There are other symptoms produced by the attack in certain cases, but these are the more prominent. Cold, wet weather appears to favour the spread of the disease, while warm, dry weather restricts it. It is thought that insects are the chief carriers of the causal organism, just as in the similar disease known in America as fire blight, but the authors consider this to be a distinct organism. Different varieties appear to present different degrees of susceptibility to the disease. It has been observed in 'Beurré d'Amanlis,' 'Catillac,' 'Vicar of Winkfield,' 'Louise Bonne de Jersey,' 'Conference,' 'Bellissime d'Hiver,' 'Dr. Jules Guyot,' 'Williams' Bon Chrétien,' and 'Pitmaston Duchess' among pears, particularly in the first two; and in 'Beauty of Bath,' 'Bramley's Seedling,' 'Allington Pippin,' 'Devonshire Quarrenden,' and 'Duchess of Oldenburg' among apples. The same organism was isolated from Myrobella Plum flowers which showed no injury, so that it may occur without producing pathogenic symptoms. Infection experiments were performed.—F. J. C.

Fruit Trees, Nomenclature of Different Parts of the Tree. (*Pom. Franç.* No. 9, 1914; figs.).—A very good résumé of the technical terms used by French fruit-growers. Published as an attempt to secure uniformity in description.—E. A. Bd.

Fruits, &c., in certain Gases, Respiration of. By G. R. Hill (*U.S.A. Exp. Stn. Cornell, Bull.* 330; April 1913).—It was found that both green and ripe fruits respired rapidly, and that even in the absence of air respiration in ripe cherries, blackberries, and grapes is very rapid. Fruits which spoil quickly respire more rapidly than do others. Ripe apples lose their colour, texture, and flavour when kept for a sufficient length of time in oxygen-free gases, and the need for free aeration in fruit stores is thus indicated. The softening of peaches seems to be decreased greatly by carbon dioxide, and to a considerable

extent by hydrogen and nitrogen. They become brownish and acquire a bad flavour when oxygen is withheld from them. "Ice-scauld" seems to be due to insufficient oxygen and to an accumulation of carbon dioxide within the paper wrappers in which peaches are often packed. Good ventilation in conjunction with refrigeration is of prime importance for the successful storage of fruit.—*F. J. C.*

Germination, Delay in. By William Crocker and Wilmer E. Davis (*Bot. Gaz.* lviii. pp. 285–321, October 1914; 8 figs.).—The authors point out that the germination of seeds is delayed by exclusion of water as in "hard-seeded" legumes, &c., by the envelopes surrounding the embryo, which prevent swelling, as in *Alisma* and other water plants, or which exclude oxygen, as in some Compositae, and perhaps by a deficiency in nutritive salts. The slow development of acid delays development of the embryo in some Rosaceae.

Some embryos, however, remain dormant even when all coats are removed.

The seeds of *Alisma*, with which the authors experimented, remain in water for years without germinating, but an air-dry seed when freed of the envelopes increases 40 per cent. of its weight in two hours, and slowly afterwards to 50 per cent. When partly swollen and still within the coats, it probably exerts a pressure of 100 atmospheres against the seed-coat.

When the coat-cap is removed from the embryo, the latter swells even more rapidly (60 per cent. more in two hours and 100 per cent. after 20 hours). The imbibitional force of the embryo is increased greatly by bases and very slightly by acids. These probably affect germination by weakening the seed-coats, though they may also affect osmosis.

At the expense of its stored food only, the embryo of *Alisma* is capable of an elongation of 120 per cent. in total absence of oxygen. To become green at least 5 mm. of air pressure is necessary, and more than 5 cm. to produce branching or to develop primary roots.

Seeds of land plants cannot usually survive for more than a short time when lying in water.—*G. F. S. E.*

Germination of *Avena fatua*. By W. M. Atwood (*Bot. Gaz.* lvii. pp. 386–414, May 1914; 13 figs.).—The exact nature of the changes which result in *after-ripening* of the seed cannot be given positively. But the acid contents of the embryo and its permeability to water are increased, resulting in increased water-absorbing power.

Both shell-coats and seed-coats interfere with oxygen supply. The results of the author's experiments obtained by breaking and searing the seed-coats, by removal of the embryo, by varying concentrations of oxygen, and by direct measurement of the rate of oxygen intake with intact and seared seeds seem to show that the limiting factor to germination is probably a restriction in the supply of oxygen.

After-ripening occurs with drying of the seed, but is independent of it, for the percentage of germination in air-dried seeds soon after harvest is lower than it is in spring for seeds with the same water content.

Light does not affect germination.—*G. F. S. E.*

Germination Power of Seeds. By Marvin L. Darsie, Charlotte Elliott, and George J. Peirce (*Bot. Gaz.* lviii. pp. 101-136, Aug. 1914; 18 figs.).—The authors refer to the length of time during which seeds may retain their power of germination, the oldest known cases being three seeds of *Cassia* which germinated when eighty-five years of age. The majority of seeds of cultivated plants cannot survive one year of burial in earth, as shown by certain experiments at Washington, though many weed seeds showed but little deterioration in that time.

The numerous experiments given in this paper were intended to test whether the temperature in Dewar's flasks in which seeds were germinated could be taken as a test of their germinating power or of their viability.

The authors found that each species had, like the higher animals, a normal temperature. When the temperature was in excess of the normal it was usually found that the seeds were infected by fungi. Subnormal temperature indicated lessened vigour. Increased age very generally resulted in decreased vigour.

The average daily heat yield in terms of ten grams of seeds varied as follows:—Indian corn .49 C., oats .55, wheat .73, clover .75, barley .88 and hemp 1.82.—*G. F. S. E.*

Gooseberry Mildew, Control of. By G. C. Gough (*Gard. Chron.* November 7, 1914, p. 303, and November 14, p. 319).—Discusses four methods.

1. Destruction of infected plants, which is shown to be unnecessary except where percentage of infected plants is not high.

2. Spraying is generally too costly. Conidia being released throughout the growing season, infection may be as constant as growth. Where only recently infected it may serve a good purpose.

3. Treatment of soil. Lime hoed in in March has been found to do good.

4. Removal of diseased tips. This is the best course to pursue. Best done late enough to insure no fresh growths being made, in most seasons in September. If it makes bushes too dense, the centre should be kept open.—*E. A. B.*

Graft Hybrids from a Cytological Point of View. By J. N. Martin (*U.S.A. Hort. Soc., Iowa, Trans.* 1913, pp. 161-166).—The writer discusses three types of phenomena arising through grafting which are often designated as graft hybrids—anomalous plants arising as adventitious branches from the wound callus, modifications of the

stock or scion through a physiological disturbance, and the variegation of leaves brought about by what the Germans call "Infektiöse Chlorase." If true hybrids can be obtained by grafting, either the character-determining factors are not limited to the nucleus, but are present in the cytoplasm as well, and able to pass through the connecting strands of cytoplasm from the cells of one member of the graft into the cells of the other, or nuclear fusion must take place between the cells of the stock and scion. Light has been thrown upon the problem of the apparent mixture of characters in the vegetative tissues without a mixture of character factors in the reproductive cells by Baur's work on the *Pelargonium*, where a variety with colourless leaves grafted on a green variety has resulted in many adventitious branches at the junction of the tissues of the two varieties with leaves of various mixtures of white and green. The writer holds that this is not really a case of a mixture of characters, but a mixture of the two different tissues, each of which retains its individual characters, and that there is no satisfactory proof that any modification or mixture of characters brought about by grafting is transmissible through the germ plasm, while the fact that cells of different species can enter into such close union as they do in some of the so-called hybrids, and yet retain their individual characters, is strong proof that the character-determining factors are locked up in the nucleus and are only transmitted through nuclear fusion. If we accept the criticism that a hybrid must contain a hybrid germ plasm, then the existence of graft hybrids has not been established.—*A. P.*

Hops as Manure, Spent (*Jour. Bd. Agr.* vol. xxi. No. 5, p. 439).—Although spent hops are relatively poor in potash as compared with well-rotted farmyard manure, in other respects the two manures are not dissimilar in composition. Spent hops possess a considerable capacity for absorbing moisture. As regards soil, they have been proved to be an excellent manure on light and medium soils, and there is little danger of their making the land sour provided the soil does not become unduly depleted of lime. In particular spent hops would seem to make an excellent mulch for fruit trees, &c.—*A. S.*

Hybrids and the Mutation Hypothesis. By Edward C. Jeffrey (*Bot. Gaz.* vol. lviii. pp. 322–336, October 1914; 4 plates).—An important characteristic of hybrids is that the spores are frequently infertile or irregular. The author has examined spores and pollen in a great number of plants. If malformation of spores involves hybridization in the past, then it was found that not only *Oenothera* but a whole series of other plants are probably hybrids.

No evidence of hybridization (on the above reasoning) was found amongst either liverworts or mosses except in the single case of *Sphagnum*, nor amongst the Lycopodiales.

Equisetum × *littorale* appears to be a cross *E. arvense* × *limosum*. *E. variegatum* var. *Jesupi* is probably *E. hiemale* × *E. variegatum*.

None of the ferns, excepting Polypodiaceae, showed signs of hybridization, but in that group there were numerous cases, e.g. *Adiantum* × *hybridum* and Benedict's eleven Eastern U.S. hybrids. None was found amongst Gnetales, Cycadales, Ginkgo, or any of the conifers excepting one species of *Abies*.

Amongst monocotyledons, garden species of *Iris* (not wild species), *Narcissus*, Tulips, and *Lachenalia Nelsoni* showed evidence of hybridization.

Of dicotyledons, *Rosa*, *Rubus*, *Sorbus*, and *Prunus* showed in many cases imperfect pollen. *Prunus serotina*, which is isolated by its time of flowering, and a Japanese *Sorbus* were the only two examined which had perfect pollen.

Nearly all common herbaceous garden plants, such as Carnations, Petunias, Phloxes, Chrysanthemums, Calceolarias, certain Primroses, &c., are hybridized.

In *Rhododendron catawbiense* the pollen is uniform, but in two hybrids it was not so.

Amongst the Onagraceae, *Epilobium angustifolium* appears to be a pure species, but *E. hirsutum* and the section Chamaenerion seem to be hybridized.

In *Oenothera Lamarckiana* and *Oe. biennis* the pollen is very far from being normal; that is also the case with the mutants of the first-named species.

Monotypic genera of Rosaceae, or those with few well-marked species, such as *Kerria*, *Rhodotypos*, and *Cydonia*, have normal pollen.

Hence, according to the author, no light is thrown on the actual origin of the species by the case of *Oenothera* or by mutation phenomena. They only reveal a multiplication of species by hybridization.

The author's views are perhaps best expressed by the title of another of his papers, "The Mutation Myth."—G. F. S. E.

Insects, Can they become Resistant to Sprays? By A. L. Melander (*Jour. Econ. Entom.* vii. pp. 167-173; April 1914).—The author suggests that resistance to the poisonous effect of lime-sulphur may become hereditary in certain scale insects, and that immunity may be secured by caterpillars after repeated small doses of arsenic.—F. J. C.

Insects, Fungus Parasites on Living. By Roland Thaxter (*Bot. Gaz.* lviii. pp. 235-253, September 1914; 4 plates).—The author describes four new genera and in all ten species of fungi obtained from living insects. Most are from the tropics (Cameroons, Amazons, Philippines, &c.). Three of these genera are allied to well-known Hyphomycetes, which are often saprophytes or plant parasites; a fourth genus is also a Hyphomycete, and the fifth is nearest to Chytridiales.—G. F. S. E.

Insects Harmful to Newly-budded Rose, Apple, and Plum Stocks. By J. C. F. Fryer (*Jour. Bd. Agr.* vol. xxi. No. 7, pp. 636-637).—In this attack the bud dies, even after it has become

partly welded to the stock, and on examination a number of small bright-red maggots are found underneath the bud or under the bark of the stock, where the incision was made. The pest has been provisionally identified as *Clinodiplosis oculiperda* Ruebs., a fly belonging to the Cecidomyidæ or Gall Midge family. As a preventive of attack it is suggested that the usual raffia tie should be replaced by woollen thread which has previously been dipped in turpentine mixed with a little linseed oil and naphthalene, the threads to be thoroughly dried before using.—A. S.

Ipomoea grandiflora. By S. Mottet (*Rev. Hort.* Apr. 1, 1914, pp. 150-152; 1 ill.).—A description of this species, of robust growth under glass and long-continued florescence, bearing very large pure white flowers, opening suddenly, 10 to 12 centimetres diameter, towards evening. Culture easy.—C. T. D.

Larch Killed by a Longicorn Beetle. By B. B. Osmaston (*Quart. Jour. of Forestry*, No. 4, vol. viii. pp. 277-279; October 1914).—A species of longicorn beetle (*Tetropium gabrieli* var. *crawshayi*), which does not appear to have attracted the notice of foresters up to the present, has recently forced itself upon attention by the damage it was doing in larch woods in more than one locality in England. The beetle lays its eggs in crevices in the bark of sickly larch trees, from about 6 inches diameter upwards. The larvæ, on hatching out, devour the soft bast and cambium layers, penetrating 2 inches or so into the wood prior to pupation. The tree is quickly killed, and some damage done to the outer layers of the wood, but chiefly to the sapwood. The beetle is dull black and about $\frac{1}{2}$ inch in length; the antennæ about two-thirds as long.

Methods to combat the insect.—Existing plantations should, as far as possible, be kept free from sickly trees. Where a tree shows signs of being attacked by this beetle, recognized in summer by wilting foliage, and confirmed by finding larvæ at work under the bark, the tree should be at once felled and converted or barked, the slabs or bark, as the case may be, being burnt.

In future plantations of larch it will be well to aim at producing healthier conditions of growth, if possible. This object may perhaps best be attained:

(1) By restricting the planting of larch to suitable localities where this species is known to thrive.

(2) By avoiding pure plantations of larch, which introduce unnatural conditions.

(3) By avoiding overcrowding in the pole stage.—A. D. W.

Lawn Sprayer, an Ingenious. By Max Garnier (*Rev. Hort.* May 1, 1914, p. 213; 1 woodcut).—To obviate the stopping up of the small holes of metal roses, the spray is induced by close adjustment of a metal cone to the orifice of an ordinary jet, as shown by the woodcut, a simple and apparently very practical remedy.—C. T. D.

Lemon, Black Pit of. By C. O. Smith (*Phytopathology*, iii. pp. 277-281; December 1913; fig.).—Spots, firm in texture, and reddish brown or brown to black, appear on the rind of certain varieties of Californian lemons. A thorn stab is usually present in the centre of the spot. A bacillus hitherto undescribed, and now named *Bacterium citriputeale*, was isolated from the spots and proved capable of reproducing the disease when inoculated into the rind of healthy lemons.—*F. J. C.*

Lettuce Drop. By O. F. Burges (*U.S.A. Exp. Stn., Flor., Bull.* 116; 1914).—Lettuce drop can be readily distinguished from any other lettuce disease. The first sign is wilting of one leaf, then more leaves droop, and finally the whole plant rots. The disease is caused by a fungus *Sclerotinia Libertiana*, the parasitic stage of which does not form conidia, but exists as mycelium. Later, black bodies, known as sclerotia are formed, which remain dormant in the soil for some time, and then develop small fruiting bodies, the apothecia one quarter to one third of an inch in diameter. Spores are given off by the apothecia; these germinate, but must first grow on dead vegetable matter before they can infect fresh lettuce plants.

Sclerotinia Libertiana also causes foot-rot of celery, and can also attack cabbages.

The following treatment is recommended :—

- (1) Remove and burn all plants as soon as they show signs of disease.
- (2) Drench the place where infected plants have stood with Bordeaux mixture 5-5-50 formula, or copper sulphate solution, 1 lb. to seven gallons of water.
- (3) Do not grow celery or cabbage on land infected with lettuce drop or vice versa.
- (4) Set out only healthy plants.—*D. M. C.*

Lime-Sulphur Solution (*Agr. Gaz. N.S.W.* vol. xxv. pp. 620-622).—Bring into an iron boiler of 67 gallons capacity 53 lb. of freshly burnt quicklime, 100 lb. of flowers of sulphur, and 25 gallons of water, and stir thoroughly. Then add an equal quantity of water and boil briskly for one hour. Hot water is added to replace what is lost by evaporation. For winter spraying add one gallon of this mixture to 7 gallons of water; for summer spraying take one gallon to 28 gallons of water.—*S. E. W.*

Lime, The Relative Effect of Oxide and Carbonate on certain Soils. By H. B. Hutchinson and K. MacLennan (*Jour. Agr. Sci.* vi. pp. 302-321; September 1914; figs.).—Caustic lime has a double effect on soils. It causes partial sterilization and decomposes some of the soil organic matter. The amount necessary to bring about these changes varies according to the nature of the soil, especially as regards the amount of organic matter present. Carbonate has a less vigorous action. The paper should be consulted for the figures relating to plant growth.—*F. J. C.*

Loganberry By-Products. By C. I. Lewis and F. R. Brown (*U.S.A. Exp. Stn., Oregon, Bull.* 117, 1914; figs.).—Deals with the preparation of syrups from this fruit, and gives various recipes for its utilization in the kitchen.—*E. A. Bd.*

Maize, Somatic Variation in. By R. A. Emerson (*U.S.A. St. Bd., Nebraska, Bull.* 4, 1914; figs.).—A genetic study of a recurring somatic variation in variegated ears of Maize.—*E. A. Bd.*

Manure, Loss of Weight in Transit. By the Duke of Bedford, K.G., F.R.S., and Spencer U. Pickering, M.A., F.R.S. (*Woburn, 14th Rep.*, 1914, pp. 73-85).—Owing to the deficiency in weight of London manure on delivery, amounting in some cases to 20 to 30 per cent., experiments were undertaken to ascertain the normal loss of manure from evaporation during a two days' journey and the loading and unloading of the trucks. The results show that the loss may vary, according to the character of the manure and the manner of handling, from 8 per cent. to about ten times that amount, and any material excess above these amounts should be regarded with suspicion.—*A. P.*

Medicinal Plants in England, The Cultivation and Collection of. By W. A. Whatmough (*Jour. Bd. Agr.* vol. xxi. No. 6, pp. 492-510; plates).—"When this article was first projected it was intended to be an appeal to wholesale druggists and drug merchants to make some effort to prevent the extinction of drug cultivation in England. The advent of the European war has completely changed the situation. Growers of medicinal plants are now being bombarded with inquiries for supplies, especially of belladonna leaves and root." The first part of the article is given to a short general review of the sources of drug plants, and the rest consists of information relative to the cultivation of such British drugs as are at present of most importance, with brief notes of others more or less affected by the war crisis.—*A. S.*

Mistletoe on the Rose (*Rev. Hort.* Apr. 16, 1914, p. 172).—The rare case is cited of Mistletoe appearing on a cultivated Rose in Alençon. It has been noted on the wild Rose, but has not hitherto been observed on a cultivated variety.—*C. T. D.*

Mole, The Food of the Common. By P. B. White (*Jour. Bd. Agr.* vol. xxi. No. 5, pp. 401-407).—In a recent Bulletin of the Kansas Experimental Station, Scheffer discussed the habits and food of the Kansas Mole, *Scalops aquaticus*, and concluded that this mole is to be regarded as a valuable asset to the agriculturist, not only in warring against certain insect pests (notably "white grubs"), but also in the aeration of the soil—its work in this direction more than atoning for the slaughter of the earthworms on which it largely feeds. The appearance of this article led the Zoological Department of the University College of North Wales to undertake a similar investigation into the nature of the food of the Common Mole, *Talpa europaea*. An examination of the

stomach contents of a large number of specimens made it clear that whilst the *menu* of the mole is a long one, earthworms and, in the moles examined, leather-jackets are to be looked upon as the staple articles of diet. Centipedes came next, and then wireworms. It is estimated that the moles in question consumed twenty leather-jackets on the average a day; that is to say, in the course of six months a single mole would account for 3,650 leather-jackets—no inconsiderable number.—A. S.

Mountain Ash Berries as Food (*Jour. Bd. Agr.* vol. xxi. No. 7, pp. 637–638).—The fruits of the Mountain Ash may be put to a variety of uses, but the chief seems to be for the preparation of a jelly which serves as a substitute for red-currant jelly for serving with game. It has an astringent flavour, however sweetened, but it is said to be by far the best jelly for use with venison. Two recipes are given.—A. S.

Names, New, Registration of. By G. T. G. (*Rev. Hort.* Apr. 16, 1914, p. 169).—In France it is permitted to protect the copyright of names of flowers by registration, even before the flowers are produced and certificated. Raisers are therefore advised to note this in order to avoid the risk of giving a name already registered by others and thus having to adopt another.—C. T. D.

Narcissus Flies, Further Notes on. By J. C. F. Fryer (*Jour. Bd. Agr.* vol. xxi. No. 5, pp. 424–426).—These notes are supplementary to the article which was published in the *Jour. Bd. Agr.* vol. xxi. No. 2, and which has since been issued as Leaflet No. 286. It consists mainly of observations on the habits of *Merodon equestris* and *Eumerus strigatus* when egg-laying. It is shown that both like to lay their eggs below the surface of the soil, and that in consequence the hole left over the bulb as the foliage dies is a distinct danger to the plant. It is suggested that the filling up of these holes by raking the surface would be a good preventive measure. A final paragraph is devoted to the question whether *Eumerus* will attack sound bulbs. "Many hundreds of bulbs attacked by *Eumerus* were examined last year, and in many cases there was no evidence of the presence of other disease," and as it seems that there is little evidence to justify the assumption that *Eumerus strigatus* is a harmless scavenger it is wiser to treat it as a pest.—A. S.

New Plants from Central America. By John Donnell Smith (*Bot. Gaz.* lvii. pp. 415–427; May 1914).—New species of *Erysimum*, *Xylosma*, *Sloanea*, *Ilex*, *Connarus*, *Drepanocarpus*, *Lonchocarpus*, *Leucaena*, *Pithecolobium*, *Rubus*, *Gilibertia*, *Faramea*, *Jacquemontia*, *Cyphomandra*, *Brachistus*, *Columnea* (two species), *Aegiphila* and *Scutellaria* are here described. Also a new genus, *Guamatela*, of Rosaceæ.—G. F. S. E.

Oenothera Lamarckiana, Origin of. By Hugo de Vries (*Bot. Gaz.* lvii. pp. 345-361, May 1914; 3 plates).—This article is in answer to a series of papers by B. M. Davis in which it was suggested that the mutability of this plant might be the result of *previous* crosses. Professor De Vries gives in this paper an historical investigation of the specimens found in the herbaria of Lamarck, Pourret, and Michaux. *Oe. Lamarckiana* appears to be still the same plant as those represented in these herbaria. It occurs *without locality* in Michaux's flora of the Eastern United States. It is also well established in a wild state in England, and it is from this wild species that the present cultivated strains have in all probability been derived.

These wild English plants may have arisen from seeds collected by Michaux or others of his time.—G. F. S. E.

Oncidium concolor and O. Ottonis. By R. Schlechter (*Orchis*, vol. viii. pp. 57-61; 2 plates).—*Oncidium Ottonis* is a native of South Brazil, and is frequently mistaken for *O. concolor*. The accompanying plates indicate many of the points of difference. The pseudo-bulbs of *concolor* are larger than those of *Ottonis*; *concolor* has greenish-yellow sepals; the sepals of *Ottonis* are waved and streaked with purple. The petals are slightly waved in *concolor*, and strongly waved in *Ottonis*. The ears of the pillar are yellow in *Ottonis* and purple in *concolor*.—S. E. W.

Oncidium patulum. By R. Schlechter (*Orchis*, vol. viii. pp. 18, 19; 1 col. plate).—This epiphyte was discovered in a collection of orchids from Brazil. It has a compact habit, with wedge-shaped pseudo-bulbs, which are barely visible. The dark-green leaf terminates in a short point. The flower stem is 5 to 7 inches long and hangs down. It is green, with purple spots, and bears 20 to 30 yellow flowers with brown marks. The flowers resemble those of *O. Cavendishianum*, but are smaller. These orchids require an abundant supply of water during their period of growth, but must be kept dry when at rest.

S. E. W.

Onion Insects. By H. T. Fernald and A. I. Bourne (*Jour. Econ. Entom.* vii. pp. 196-200).—*Thrips tabaci* Linde causes considerable damage to onions by sucking the sap from the leaves. Clean cultivation appears to offer the best means of keeping the pest in check, especially as it hibernates among grass as a perfect insect.

Onion maggots were found extremely difficult to deal with, and no entirely satisfactory method has been devised. A full account of the experiments appears in *U.S.A. Exp. Stn., Mass., 25th Ann. Rept.*

F. J. C.

Orchid, Sowing of Seed with Endophytic Fungi. By G. T. Grignan (*Rev. Hort.* July 16, 1914, pp. 318-20; 1 ill.).—Abstract of Dr. Jean Gratiot's notes *re* experimental sowings of seeds of orchids

difficult to raise, with the aid of symbiotic fungi on the principle enunciated by Noel Bernard in 1908. The results have been highly successful, but it is considered that such success is attainable only by virtue of special scientific treatment.—C. T. D.

Passion Vine, Woodiness (*Agr. Gaz. N.S.W.* vol. xxv. p. 688).—A vigorous growth of the vine tends to prevent "woodiness" or "bullet." To induce this desideratum apply blood and bone manure in the autumn at the rate of 5 cwt. to the acre; in spring potassium sulphate $\frac{3}{4}$ cwt., ammonium sulphate 2 cwt., and $1\frac{1}{2}$ cwt. of superphosphate. In December dress with potassium sulphate $\frac{1}{2}$ cwt., superphosphate $1\frac{1}{2}$ cwt., and ammonium sulphate 1 cwt.—S. E. W.

Peach 'Cling' (*Agr. Gaz. N.S.W.* vol. xxv. p. 334; 1 col. pl.).—This Peach is derived from a chance seedling. It is excellent for canning. The fruit is roundish oblate, of medium size, with a deep suture. The colour ranges from white to red, according to exposure to the sun.—S. E. W.

Peach 'Edgemont.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 385, 1914; col. pl.).—A new Peach of promise, resembling the 'Late Crawford' in many respects. Introduced in 1902.—E. A. Bd.

Peach, 'Kia-Ora' (*Agr. Gaz. N.S.W.* vol. xxv. p. 410; 1 fig., 1 col. plate).—The Kia-Ora Peach is a regular bearer, and is less subject to leaf curl than most varieties. The fruit is of excellent flavour, suitable for drying, canning, or dessert, but requires careful handling, slightly oval, with a deep suture, yellow, splashed with crimson. The tree is a moderate, upright grower.—S. E. W.

Peach Tip Moth. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxv. pp. 413-414; 3 plates).—The caterpillars of the Peach Tip Moth, a Tortricid, attack the tips of the branches of peach trees and bore holes in the skin of the fruit, causing it to gum. The caterpillar is 0.04 inch in length. The head is dull yellow, and the back reddish pink. The moth is half an inch across the outspread wings. The fore wings are dark brown and the hind wings lighter. As soon as damage to the tips of the trees is noticed, spray with lead arsenate. The caterpillars may be caught under bandages placed round the trees.—S. E. W.

Peas, Diseases of (*Jour. Bd. Agr.* vol. xxi. No. 5, pp. 418-423; 1 plate).—The diseases dealt with are:—Powdery Mildew (*Erysiphe Polygoni* D.C.), Pea Mildew (*Peronospora viciae*, De Bary), Pea Rust (*Uromyces Fabae* De Bary), Black Root-rot (*Thielavia basicola* Zopf.), and Pea Spot (*Ascochyta Pisi* Lib.). In each case both the disease and the parasite are described, and preventive measures are suggested.

A. S.

Peridermium from Pennsylvania, Notes on. By C. R. Orton and J. F. Adams (*Phytopathology*, iv. p. 23 ; February 1914 ; plate).—The rust of certain pines, which has *Comptonia peregrina* (Sweet Fern) as its alternate host, has been thought to be *Peridermium pyriforme*, but the authors show it is not that species and propose the name *P. Comptoniae* for it. It attacks *Pinus austriaca*, *P. echinata*, *P. maritima*, *P. montana*, *P. ponderosa*, *P. rigida*, *P. sylvestris*, *P. Taeda*, and *P. virginiana*.

Cronartium Comandrae attacking *Comandra umbellata* is thought to be connected with *Peridermium pyriforme*, which attacks *Pinus rigida*, *P. pungens*, and *P. contorta*.—F. J. C.

Phylloxera Resistant Stock, Grafting. By D. Jenkins (*Agr. Gaz. N.S.W.* vol. xxv. pp. 689–692 ; 20 figs.).—The cuttings for grafting are nine inches long, and not less than $\frac{1}{4}$ inch at the narrow end. They are buried in sand until required. Before use all the buds are removed and the cuttings are washed. The scions are similarly prepared, but one eye is left. The method of grafting is illustrated by numerous cuts.—S. E. W.

Physalospora Cydoniae. By L. R. Hesler (*Phytopathology*, iii. pp. 290–295 ; December 1913 ; figs.).—The author is led to conclude, as the result of cultural and inoculation experiments, that the mature form of *Sphacropsis Malorum*, the organism of apple black-rot, is identical with *Physalospora Cydoniae* Arnaud.—F. J. C.

Pine, North American Species of. By J. C. Arthur and F. D. Kern (*Mycologia*, vi. p. 109 ; May 1914).—A review of the species of the genus *Peridermium* which causes blister-rusts on various pines and have as alternate hosts various small shrubs and herbaceous plants.—F. J. C.

Pine Rust, The Introduction of a European, into Wisconsin. By J. J. Davis (*Phytopathology*, iii. pp. 306–307 ; December 1913).—Announces the discovery, and suggests the probable mode of introduction to America, of the rust fungus so common on sow thistles in this country—*Coleosporium Sonchi-arvensis*—which in the spring attacks the foliage of Scots fir.—F. J. C.

Pinus, Spur Shoot of. By Robert Boyd Thomson (*Bot. Gaz.* lvii. pp. 362–385, May 1914 ; 4 plates and 2 figs.).—The author considers that ancestrally the leaves of the pines were spirally arranged on ordinary branches. The spur has been derived from this condition, as is shown by :—

1. The indefinite number of leaves in a fascicle (of this numerous examples are quoted).

2. Supernumerary needles occur in the recognized primitive region and after wounding.

3. The spirally-placed single leaves of the seedling and, occasionally of cone-bearing branches.

4. Transitions between scale and fascicled leaves.

The author describes also the conditions in fossil pines (*Leptostrobus*, *Prepinus*, and *Woodworthia*), which practically completes the evidence, in his view, for the spur shoot of *Pinus* being a specialized character.

G. F. S. E.

Plant Associations, Evaporation and Soil Moisture in. By George Damon Fuller (*Bot. Gaz.* lviii. pp. 193-234, Sept. 1914; 27 figs.).—On the sand dunes of Lake Michigan there is a regular succession of plant associations. The cottonwood (*Populus deltoides*) establishes itself on the sand dunes, after grasses and shrubs have partly overgrown them; it is followed by first *Pinus Banksiana*, then by black oak (*Quercus velutina*), oak-hickory (*Q. alba*) and finally, by the beech-maple association.

The authors, during 1910, 1911, and 1912, carried out observations of the rate of evaporation of the air and of the "ground-water" at various stations in each of these associations.

The results are given in graphs and tables and are of great interest, showing that the evaporation rate diminishes with each change in the character of the vegetation. The cottonwood is subject to sharp fluctuations in the mean daily evaporation rate. These are not nearly so marked in the next three associations, and in the beech-maple parent conditions seem remarkably uniform.

The differences in the amount of "growth-water" which was measured at 7.5 and at 2.5 cm. depth were as follows: Beech-maple 100, oak-hickory 75, oak dune 29, pine dune 26, and cottonwood dune 49 per cent.

* The ratios between evaporation and growth-water were 11.7 cottonwood dune, 10.7 pine dune, 9.37 oak dune, 2.78 oak-hickory, 1.81 beech-maple, and 2.91 prairie.

The cottonwood dune is remarkable for its xerophytic character and the absence of undergrowth.

The spring vegetation of the pine dune is much more mesophytic than that of summer.

The evaporation rates and amount of growth-water in the various associations vary directly with the order of their occurrence in the association.

In determining amount of growth-water weekly samples (200-250 grams) of soil were taken in each association and dried at a temperature of 100°C. till they reached a constant weight. The evaporation was measured by Livingstone atmometers.—G. F. S. E.

Plants, Skin Irritating. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxv. p. 416).—*Olearia decurrens* and *O. viscidula* induce dermatitis. The sticky substance which covers them probably causes the irritation of the skin.—S. E. W.

Pleione. By R. Schlechter (*Orchis*, vol. viii. pp. 72-80; 5 plates).—These orchids are frequently grown in too warm a house, and are not allowed sufficient rest after their period of growth. They require plenty of drainage and light, and do well in shallow basins in a mixture of leaf mould, sphagnum, and fibre. *P. Bulbocodium* is a native of Yunnan and West Szechwan, and is found from 10,000 to 14,000 feet above sea-level. Only one flower is borne on the stem, and it varies in colour from red to white. *P. Delavayi* also comes from Yunnan at an altitude of 7000 to 9000 feet. The flowers are purple. *P. Forrestii* comes from Yunnan, where it is found some 6500 to 9500 feet above the sea. The flower stem bears one bright orange-coloured flower with brown marks. *P. grandiflora* is found in Yunnan in similar surroundings to the above. It bears white flowers, slightly marked with purple lines. *P. Hookeriana* is a native of the West Himalayas, growing about 8000 to 11,500 feet above sea-level. The bell-shaped flowers are white or pale pink, with yellow lip. *P. humilis* is found in the Himalaya, Nepal, and Sikkim at an altitude of between 6500 and 6700 feet, growing on the mossy trunks of trees. The flowers are white with yellow centres and violet-spotted lip. *P. Lagenaria* bears delicate violet flowers. The labellum is white or pink, with dark red spots on the edge. It is a native of Burma and Assam. *P. maculata*, from the Himalaya and Sikkim, is an epiphyte found on trees growing 1800 to 5200 feet above the sea. The white flowers are borne on dwarf stems. The lip is spotted with yellow and red. *P. pogonioides* is found on wet rocks 3000 to 4000 feet above sea-level in China (Hupeh and Szechwan). The flowers are purple. *P. praecox* is found at a height of 4000 to 7600 feet in Burma and the Himalayas. The stems bear one or two flowers, violet, with yellow spots. *P. Reichenbachiana* is a native of Burma and grows 1000 feet above sea-level. Each stem bears a single flower of a violet colour; the lip is white, with red marks. *P. Schilleriana*, from Moulmein, also bears a single flower on each stem; the flowers are yellow, and the lip is splashed with purple or orange spots. *P. yunnanensis* has pink flowers, and the labellum is streaked with purple.—S. E. W.

Plum 'French.' By U. P. Hedrick (*U.S.A. Exp. Stn., Geneva, New York, Bull.* 385, 1914; col. pl.).—A Damson of great productivity and of good flavour. Can be eaten uncooked. A week later than the 'Shropshire.' Origin unknown, but probably a French variety.—E. A. Bd.

Poisonous Solutions, Antagonism of. By W. J. V. Osterhout (*Bot. Gaz.* lviii. pp. 178-186, Aug. 1914, 4 figs.; pp. 272-276, Sept. 1914, 3 figs.; pp. 367-371, Oct. 1914; 3 figs.).—The author explains methods of determining the antagonistic effect, if any, of two toxic solutions.

The growth of parts of a plant not in immediate contact with a poisonous solution is often deceptive. Thus in solutions of copper

salts the immersed roots do not grow at all, while the leaves, if not in contact with the solution, often grow well at the start.

When a plant is grown in mixtures of two equally toxic solutions, there may or may not be "antagonism." If not, the mixture has the same effect on growth as the pure solutions themselves.

The author explains how the antagonistic effect may be measured.

In the second paper a method of calculating the antagonistic effects of three poisonous solutions is explained. The author figures a solid model showing the forms of the antagonism curves in all possible mixtures of certain solutions of sodium, potassium, and calcium chlorides.

The third paper deals with the effect of concentration on the form of the antagonism curve. A solid model, of which an illustration is given, gives a complete description of the changes in growth produced by diluting the various mixtures. As the solutions become more dilute the antagonism curve becomes flatter. Growth in strong solutions is more satisfactory as a criterion of antagonism than in those which are more dilute.—G. F. S. E.

Pollination in Orchards. By F. J. Chittenden (*Ann. Appl. Biol.* i. pp. 37-42; May 1914).—A review of the present condition of our knowledge regarding pollination in orchards is given, and a statement of the problems that await solution.—F. J. C.

Population, The Agricultural, of England and Wales (*Jour. Bd. Agr.* vol. xxi. No. 5, pp. 408-418).—The article discusses the Census returns under the following headings: (a) The Extent of the Increase in the Agricultural Population; (b) The Proportion of the Agricultural to the Total Population; (c) The Employment of Women and Children in Agriculture.

The number of (male) nurserymen, seedsmen, florists, market and other (but not domestic) gardeners in 1911 was 140,103 as compared with 123,125 in 1901, an increase of some 17,000. It is practically certain that this is an understatement of the increase in view of the fact that the Census records an apparent increase in domestic gardeners of some 31,000, some proportion of which was certainly due to a more definite return in 1911. Taking the total number of males working in gardens, whether in market gardens, nursery gardens, or in domestic service, the increase appears to have been from 211,025 to 258,842. The counties having the largest numbers in 1911, classified under the heading "nurserymen, seedsmen, and florists" (from which are excluded, as far as possible, florists who are only shopkeepers or shop assistants), were Middlesex (3750), Hertfordshire (2186), Surrey (2147), Sussex (2135), Kent (1994), and Essex (1692); the counties with the largest numbers classified as "Market Gardeners (including Labourers)," were Worcestershire (3550), Hampshire (2122), Middlesex (2062), Yorkshire W. R. (1900), Sussex (1828), Lancashire (1799),

Gloucestershire (1744), Bedfordshire (1715), Kent (1591), Norfolk (1562), and Cheshire (1455). These figures are, however incomplete, owing to the number of persons included under the heading "Other Gardeners (not Domestic)," who would have been classified under one of the two former headings had the returns been more definite. They also fail to represent the total numbers engaged in the cultivation of fruit, vegetables, and flowers, both on account of the impossibility of separating completely such persons from those engaged in ordinary farm work, and on account of the casual labourers (fruit-pickers, pea-pickers, &c.), who would mostly be returned according to the occupations they were following at the date of the Census.

A. S.

Populus × generosa, a New Hybrid. By A. Henry (*Gard. Chron.* October 17, 1914, p. 257; with 2 figs. and Latin diagnosis).—A remarkably vigorous large-leaved seedling resulting from the crossing of *P. angulata* ♀ and *P. trichocarpa* ♂ at Kew in March 1912. A young plant at Glasnevin reached the height of 10 feet in September 1914.—E. A. B.

Potash, Ashes of Hedge-clippings and Trimmings as a Source of. By E. J. Russell (*Jour. Bd. Agr.* vol. xxi. No. 7, pp. 694–697).—As the main source of potash manures is at present cut off, owing to the war, the value of bonfire ashes has become enhanced. From a series of analyses of the ash of material resulting from hedge trimming and cleaning, it is seen that such ash is nearly as rich in potash as kainit. Thus of four samples analysed the average percentage of potash (K_2O) was 10·9 as compared with 12·5, which is the average percentage in kainit.

Bonfire ashes, to be of any practical use, must be collected at once and not exposed to the rain, for the particular compound of potash present is the carbonate, and is very soluble. Some heaps of ash were left out all one night, during which a certain amount of rain fell. The rain was not particularly heavy—·09 inch—and would not be expected to do a great deal of harm; but it brought the potash down to one-half the original amount.

The question arises, is it worth while to trim hedges simply for the sake of the ash from the cuttings? To obtain information on this point account was kept of the time required to trim measured lengths of hedge, burn the rubbish, and collect the ash, and it was found that the potash would prove very expensive if it were charged with the whole of the cost of the process. The cost, however, would be less per lb. of ash where the trimming and burning have to be done in any case, and where part of the cost is borne by the estate or the nominal establishment account; and the value of the ash might be a factor in determining whether or not a doubtful piece of work should be done.—A. S.

Potash Manures (*Jour. Bd. Agr.* vol. xxi. No. 6, pp. 562-563).—As this country's supply of artificial potash manures comes almost entirely from Germany, it is important that new sources of potash manures should be sought. The natural supplies in all sorts of vegetable refuse should be carefully utilized.—*A. S.*

Potash, Why waste? Anon. (*Perfumery Record*, Oct. 1914, p. 374).—Draws attention to the high percentage of potash in seaweeds, hedge trimmings, furze, and common weeds, such as groundsel, and recommends the utilization of their ashes for those purposes for which potash is required.—*F. J. C.*

Potato Spraying. By the Duke of Bedford, K.G., F.R.S., and Spencer U. Pickering, M.A., F.R.S. (*Woburn, 14th Rep.*, 1914, pp. 1-32).—The initial object of the experiments detailed was to ascertain the proportion of Woburn Bordeaux paste which was equivalent in fungicidal action to ordinary Bordeaux mixture. The former is simpler to prepare, and by its use a much smaller quantity of copper is required to produce a given result. The conclusion is arrived at that for the treatment of potatoes 15 to 16 lb. of the paste (containing copper equivalent of 10 per cent. of its weight of copper sulphate) to 100 gallons of water are equivalent to 8 lb. of copper sulphate in the form of the mixture, though it does not necessarily follow that this same equivalent would hold good for other fungus diseases, and where scorching of the foliage is to be feared it would be safer to adhere to half this proportion of paste. It is estimated that, with a fairly good crop and in a year when disease is rife, one spraying with a fungicide of the full strength mentioned should result in an increase of 10 to 30 per cent. of sound tubers.

The decomposition of the paste in some cases has been a drawback to its general adoption, but a method has been discovered of arresting this, and it is understood that samples are now put to the test of some hours' boiling before being put on the market.—*A. P.*

Prickly Pears of Australia (continued). By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxv. pp. 137, 138, 519, 520; 4 figs.; 2 col. pl.).—The Golden-bristled Prickly Pear (*Opuntia microdasys*), a native of Mexico, is grown for ornamental purposes. It is a low-growing shrub with oval joints and yellow fragile bristles.

The Queensland Prickly Pear, known in Queensland as Red Mexican, has large joints and powerful spines. The fruit is edible. As it is a robust grower it is a pest in some districts.—*S. E. W.*

Prunus, Cylandrosporium Disease of. By B. B. Higgins (*Amer. Journ. of Bot.* vol. i. No. 4, pp. 145-173; 4 plates).—The author gives an elaborate account of the life-history and physiology of the fungus *Cylandrosporium*, which causes a disease of plums and cherries, and has for many years attracted the attention of horticulturists and plant pathologists in Europe and America. In certain species of *Prunus*

the disease becomes very conspicuous because of the "shot-hole" effect on the leaves, produced by the dropping out of roundish areas of diseased tissue; from the leaves of other species the spots do not drop out, and in such cases, as a rule, the leaf tissue is not killed to any appreciable extent, but in cases of severe attack the leaves turn yellow and drop prematurely, thus interfering with food production and the future welfare of the tree. Although "shot-holes" are produced in the leaves of stone fruits by various organisms, or even by mechanical injury or by spraying with poisonous solutions, *Cylindrosporium* is probably the most prolific cause of this phenomenon, at least in cherries, and many have attributed all "shot-hole" effects on species of *Prunus* to *Cylindrosporium Padi* Karst., which, though in Europe almost entirely confined to *Prunus Padus*, has been found in America on nearly all species of *Prunus*, wild and cultivated. The author finds that there are at least three species of *Cylindrosporium* parasitic on *Prunus*, which in their conidial stage resemble each other very closely. The mycelium is intercellular, and obtains its food, in part at least, by means of haustoria which penetrate the host cells, a cellulose sheath being often then deposited around the haustorium by the host protoplasm. Apparently no toxin or substance injurious to the host protoplasm is secreted by the fungus, but a few of the host cells are killed probably by drying. "Shot-hole" formation in the leaves is apparently correlated with the presence of the glucoside amygdalin, which breaks down into simpler substances, thereby increasing the osmotic pressure which causes the cells around the spot to enlarge, forming the separation layer. Besides the *Cylindrosporium* conidia, three other spore forms are found in the life-cycle of the species studied—microconidia (spermatium-like bodies), ascospores, and apothecial conidia; all of these, except the microconidia, are known to propagate the fungus on living leaves. While the microconidia (spermatia?) are being formed on the surface of the stroma, ascogonium-like structures are formed with their free end (trichogyne?) projecting above the surface; but it was not ascertained whether these structures function as sexual organs. The fungus passes the winter as a stroma-like body in the fallen leaves, which in the early spring develops into an apothecium of the Phacidiaecous type. That the ascocarps are genetically connected with *Cylindrosporium* is shown by their continuous development from the stromata, and by producing infection and *Cylindrosporium* stromata in living leaves when inoculated with ascospores from leaves or with conidia from pure cultures from these ascospores. As to control measures, the author points out that now the complete life-history of the fungus is known it should be easier to devise control methods. Since it lives over winter in the dead leaves, it is important that leaves from infected trees be raked together and burnt or buried; if all such diseased leaves are destroyed there is little danger of the disease appearing the next season in such abundance as to be serious. If such destruction is not feasible, spraying should begin early, at latest by the middle of May.—F. C.

Red Spider Control. By E. A. McGregor (*Jour. Econ. Entom.* vii. pp. 324-336; August 1914).—The pest in question is known as *Tetranychus bimaculatus*, but whether the same as *T. telarius* of Europe is not at all clear. The distribution of the pest is effected by transportation by other creatures, actual locomotion, and carriage on small streams of water during heavy rains. Nine hours' submergence in water was found necessary in order to kill the pests. It is active during winter and is generally distributed, attacking about 130 species of plants, including violet, sweet pea, hollyhock, morning-glory, bean, tomato, and Dahlia. Sixteen or seventeen generations of red spider occur in the season in S. Carolina. Adverse weather conditions have some influence in checking the pest, but the main check appears to be imposed by various insects, including a small fly (*Arthrocnodax corolina*), a bug (*Triphleps insidiosus*), a ladybird (*Stethorus punctum*), a lacewing fly (*Chrysopa oculata*), and a thrips (*Scolothrips sexmaculata*), besides others of less importance. The best hope of keeping the pest in check by artificial means lies in preventive rather than repressive measures, and of these the destruction of weeds is the most important. Control of violets, choice of the more immune varieties of cultivated plants, wide spacing, perhaps late planting and rotation, are less effective means of dealing with the pest. Among repressive measures are the removal of infested plants, spraying with liver of sulphur (3 lb. to 100 gallons), home-made lime-sulphur, paraffin emulsion, resin wash, miscible oil, miscible oil and "black leaf" tobacco extract, "sulfocide," and flour paste solution. The necessity of thorough spraying is insisted upon, as only those red spiders are killed which the spray hits.—F. J. C.

Reproduction in Plants. By John M. Coulter (*Bot. Gaz.* lviii. pp. 337-352; Oct. 1914).—In this paper the author gives a general *résumé* of plant reproduction in general. The first stage of asexual reproduction is represented by cell-division, the second by spore-formation, and the third by differentiated spore-forming cells. As regards the origin of sex, gametes have been derived from zoospores so reduced in size by successive division as to be incapable of functioning as spores. There are gametes alike in every visible feature, but as they pair they are physiologically different. Gametes appear in response to unfavourable conditions and represent the closing activity of a plant. The resulting zygote, being formed under unfavourable conditions must remain dormant until better conditions appear; it may function as a spore or may produce spores.

Both the more or less elaborate swimming mechanism of the sperm and the large nutritive supply of the egg are non-essential sexual characters.

"Nor can it be true that gametes are peculiar in containing the factors of heredity, for these must have been handed down through all the cell generations leading to the gametes." Heredity expresses

itself by spores and vegetative multiplication as well as by means of gametes.

In double fertilization, fusion is not of a sexual character, for no new individual is formed.

These extracts may give some idea of the general argument in this paper.—*G. F. S. E.*

Rhinoceros Beetle in Samoa. By R. W. Doane (*Jour. Econ. Entom.* vi. p. 437; Dec. 1913; plates).—Coconut trees are often badly damaged by the rhinoceros beetle (*Oryctes rhinoceros* L.), and the author records observation made upon its attacks in Samoa, where it has recently been introduced, the winds apparently assisting its distribution. The few experiments tried with the object of checking the spread of the pest are at present inconclusive.—*F. J. C.*

Rothamsted Experimental Station, The Work of the. By E. J. Russell (*Jour. Bd. Agr.* vol. xxi. No. 5, pp. 385-394; 2 plates).—A brief account of the various experiments which are at present being carried out at the station.—*A. S.*

Scale Insects of New South Wales. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxv. pp. 127-136, 311-319, 599-610, 677-684; 5 plates).—A descriptive list of the scale insects attacking important plants in New South Wales is given, with descriptions.—*S. E. W.*

Sitka Spruce in Ireland, The. By A. C. Forbes (*Trans. Royal Scot. Arbor. Soc. Edin.*, vol. xxviii. part 2, 1914).—The value of Sitka spruce for planting on exposed sites and wet soils which occupy so large a portion of Ireland can scarcely be over-estimated. Short of submerged ground, no degree of moisture appears to be too great for this species, and it bears the salt-laden winds of the Atlantic as well as, if not better than, any tree capable of growing in the low summer temperatures which characterize this part of the United Kingdom. While common spruce will bear wet ground, it cannot thrive in very exposed places. Corsican and Austrian pines stand wind well, but dislike wet soils for any length of time, and before the introduction of the Sitka spruce it was difficult to find a conifer which could give a satisfactory return on many sites with which the planter has to deal along the western seaboard of Ireland or Scotland.

The only serious enemy of the Sitka spruce hitherto observed in Ireland is a species of aphid, apparently identical with that of the common spruce, and usually known as *Aphis abietina* Walker.

A. D. W.

Smoke Injury to Plants, Measuring the Extent of. By A. L. Bakke (*U.S.A. Hort. Soc., Iowa, Trans.*, 1913, pp. 112-114).—There is a direct relationship existing between transpiration and growth, and when smoke interferes with the former the extent of the retardation can be measured by the use of a modified cobalt chloride method.

Measurement can be made of trees that are located in the heart of the city, in the beginning of the residential portion, and later in the suburbs. By such a system of comparison the extent of smoke injury can be obtained long before it can be detected by general examination.

The method of measurement adopted consists in placing on the upper surface of a leaf, under protection from the air, a filter paper which has been dipped in a 3 per cent. solution of chloride and dried, and noting the time it takes to change from blue to pink. A similar paper is put on the under surface of the leaf, and in this way a quantitative method of comparative transpiration among different plants is obtained.—A. P.

Smut-fungi, Biology of the. By A. W. Bartlett (*New Phyt.* vol. xii. Nos. 9-10, pp. 358-361).—The author gives a useful summary of various recent publications on this important group of parasitic fungi, formerly called Ustilagineae, but now placed in a special class—*Hemibasidii*—coming just below the *Basidiomycetes* proper. Apart from the cytological results discussed, the most important part of this note is the summary given of Brefeld's recent work on the biology of the Smut-fungi. These fungi are apparently able to penetrate only into the very young tissues of the host-plant, and when the tissues have reached maturity they are quite inaccessible to the entrance of the parasite. The parts of the plant through which infection can take place are (1) the seedling in a very early stage of development, (2) the young pistil of the flower, (3) all the young growing-points of roots, stems, leaves, flowers, &c. In the first instance infection is probably brought about by the sporidia produced by the resting-spores (chlamydospores), which germinate on the soil where they have fallen. In the second, the chlamydospores are probably conveyed by insects or the wind from an infected flower to the pistil of a healthy one, the fungus entering the ovule and the mycelium remaining in the seed during its resting period, renewing its growth only when the seed germinates and then finding its way into the growing-point of the stem; hence a considerable period may intervene, as also in the first case, between infection and the development of the chlamydospores in the flowers, leaves, or other parts of a plant, and throughout this period (which may last several months) the mycelium in the growing apex of the stem keeps pace in its growth with the growth of the plant without betraying the smallest signs of its presence. In most of the *Hemibasidii* the chlamydospores are developed in some part of the flower of the host, particularly the ovary, but often in the stamens as well—sometimes exclusively in the latter; but some species produce these spores in the tissues of the leaves or stem. These spores are well adapted to withstand unfavourable external conditions; they often germinate only at the end of a long resting period, and in some species were found to retain their viability for at least ten years. The perennation of the mycelium in the tissues of the host-plant presents some interesting features. This perennation takes place chiefly in the underground

stems, whence the mycelium passes each year into the growing-points of the aerial shoots. It has been found that while in slow-growing plants, like species of *Primula*, the duration of the fungus in the annual shoots is assured year after year, the hyphæ are unable to keep pace with the extension in length of the shoots of plants of rapid growth, so that the fungus disappears after a certain number of years and the plant finally becomes free from the parasite.—*F. C.*

Soil Fumigation. By J. A. Hyslop (*Jour. Econ. Entom.* vii. pp. 305-312; Aug. 1914).—The author records the results of experimental soil fumigation with sodium cyanide in both laboratory and field against wireworms. The impure salt (containing 74 to 76 per cent. sodium cyanide) was sown on the soil at the rate of 300 lb. to the acre, with the result that all the wireworms were killed. This was done at the beginning of October. At this rate and also at half this rate the plants were killed as well, so that it appears unsafe to add sodium cyanide for fumigating purposes while plants occupy the soil. The cyanide was sown six inches beneath the surface.—*F. J. C.*

Soil, Fungous Flora of the. By C. N. Jensen (*U.S.A. Exp. Stn., Cornell, Dep. Pl. Path., Bull.* 315; 1914).—The fungus flora of the soil is taken to consist of obligate saprophytes and facultative parasites, the former in far larger numbers than the latter.

Some facultative parasites, such as *Rhizopus nigricans*, *Trichoderma Koningi*, and *Pythium Debaryanum*, are very widely distributed.

A considerable number of soil fungi and bacteria are described and figured, and a good bibliography of previous work on this subject is given, dating back to Kuhn's work on plant diseases in 1858.

D. M. C.

Soil Particles, Distribution of. By the Duke of Bedford, K.G., F.R.S., and Spencer U. Pickering, M.A. F.R.S. (*Woburn, 14th Rep.*, 1914, pp. 37-45).—Preliminary experiments on the effect of rain on the flocculation of the soil. They show that the proportion of fine particles in a surface soil is increased by the amount of rainfall during approximately the previous three weeks. This is a factor which is amply sufficient to cause considerable difference in the behaviour of plants in the same soil on different occasions.—*A. P.*

Sparrows, Some Observations on the Food of Nestling. By W. E. Collinge (*Jour. Bd. Agr.* vol. xxi. No. 7, pp. 618-623).—During 1913 and 1914 the writer examined the stomach contents of 287 nestling sparrows. Of these 200 came from fruit-growing districts and the rest from suburbs. The results are tabulated in detail.

From an examination of these tables it is seen that in a single day one hundred nestling house sparrows require nearly 2000 insects for food in fruit-growing districts, and about a third of that quantity in suburban districts. Further, with the exception of a few spiders and earthworms, the whole of the food consists of injurious insects.

It may be said that during the whole of the nesting period the parent birds are feeding upon food similar to that fed to the young.

The writer is of the opinion that, in spite of all that has been written with reference to the depredations of the house sparrow, we do not yet possess that completeness of knowledge that justifies us in condemning it to be exterminated. On the contrary, he believes that whilst it is undoubtedly too plentiful, if it were considerably reduced in numbers the good that it would do would probably more than compensate for the harm, especially in fruit-growing districts.—A. S.

Spring-tails, Injury to Crops. By D. E. Fink (*Jour. Econ. Entom.* vii. pp. 400–401; April 1914; pl.).—Seedling cucumbers, lettuce, spinach, turnip, kale, potato, tomato, cauliflower, and peas were attacked by hordes of spring-tails (*Smyntihurus* sp.), which also devoured the eggs of the Colorado beetle with avidity. The damage done took the form of irregular holes, sometimes eaten completely through, but often having a layer of epidermis left. They also enlarge the holes begun by flea-beetles &c. Arsenite of zinc, applied at the rate of 2 lb. to 50 gallons of water, kept them in check.

F. J. C.

Spruce Aphis, Notes on the Green. By F. V. Theobald (*Ann. Appl. Biol.* i. pp. 22–36; May 1914; figs.).—This aphis (*Aphis abietina*) appeared on spruces in 1913 and 1914 in injurious numbers, and caused the defoliation and death of large numbers of trees. It has been known to occur in this country and on the Continent for many years, but is usually present in small numbers only. It has been found on *Picea excelsa*, *P. sitchensis*, *P. pungens*, *P. Engelmannii*, *P. nigra*, *P. alba*, *P. gigantea*, *P. rubra*, *P. Morinda*, *P. orientalis*, *P. monstrosa*, *P. Omorica*, *P. Kosteriana* (?), *P. Glehnii*, but there are no records of its attack of *P. polita*, *P. hondoensis*, *P. Alcockiana*, or *P. alaskiana*. The author has seen it also on Scots fir and on Weymouth pine. It appeared to be very generally distributed over England and Wales. Spraying with nicotine and soap and with paraffin jelly was found to be effective (see p. xlv). The life history is given, together with a description of the insect, and the author appears to consider the prevalence of the pest to be due in a measure to the unhealthy conditions set up in the trees through the uncongenial weather of the previous seasons.—F. J. C.

Stangeria paradoxa var. typica. By H. Strauss (*Gartenflora*, vol. lxiii. pp. 163–164; col. plate).—*Stangeria paradoxa* has been described by Moore and by Hooker (*Journ. Bot.*). It belongs to the order of Cycadaceae, but was formerly mistaken for a tree fern. The form *typica* is distinguished from *Schizodon* by the serration of the leaves. In the latter the whole edge of the leaf is serrate, but in the former only the upper half of the leaf.—S. E. W.

Strawberries. By J. Oskamp (*U.S.A. Exp. Stn., Purdue, Bull.* 164, 1914; figs.).—Cultivation of the Strawberry, report of variety test, and descriptions of many varieties.—*E. A. Bd.*

Streptocarpus × Banksii. By R. I. Lynch (*Gard. Chron.* September 12, 1914, p. 192; with fig.).—A new hybrid raised at Cambridge between *S. Wendlandii* ♂ and a named form of the usually grown hybrid strain as ♀. A fine, tree-flowering plant, with purple flowers.—*E. A. B.*

Streptocarpus × Blythinii. By R. I. Lynch (*Gard. Chron.* October 17, 1914, p. 258; with fig.).—*S. cyaneus* ♂ and *S. Wendlandii* ♀ have produced a hybrid with lavender-coloured flowers and large, handsome leaves.—*E. A. B.*

Thermotropism of Roots. By Sophia Eckerson (*Bot. Gaz.* lviii. pp. 254–263, Sept. 1914; 6 figs.).—The author found that *Raphanus* roots showed positive curvature when grown in the thermostat at 7°–15° C. temperature; at 16°–23° C. no curvature; 24°–36° C. positive and at 38°–51° negative curvature. *Pisum* roots showed positive reaction at 8–15° C., no curvature 17°–29° C., and negative at 34°–50° C.

She then examined the permeability of the root protoplasm of these plants at varied temperatures, and found increased permeability in *Raphanus*, *Pisum*, and other plants at temperatures corresponding to positive curvature. There was no change in permeability when there was no thermotropic reaction, and a decrease in permeability at those temperatures which produced negative thermotropism.

She concludes that with unequal temperature on opposite sides of a root, the root will curve only if the cells are more permeable at one of these temperatures than they are at the other. The more permeable cells are less turgid, and so the more permeable side of the root becomes concave.—*G. F. S. E.*

Thrips in Orchards. By W. B. Gurney (*Agr. Gaz. N.S.W.* vol. xxv. pp. 685–687).—To prevent the damage caused by thrips to late apples and cherries, the weeds, dead refuse, and green manure between the trees should be turned over and the soil ploughed as near to the trees as possible. Spray the trees, as late as possible before the buds open, with lime-sulphur mixture. As the buds open, spray once or twice with tobacco wash.—*S. E. W.*

Thymol, Sources of. Anon. (*Perfumery Record*, Oct. 1914, p. 374).—Ajowan seeds grown in India, Persia, Afghanistan, and Egypt are the most important source of this valuable product, but it is pointed out that *Origanum hirtum*, *Thymus vulgaris* and other thymes, *Monarda punctata*, *Mosla japonica*, and *Satureja Thymbra* are likely to yield considerable quantity. Species allied to those named usually contain carvacrol.—*F. J. C.*

Tobacco Wash. By W. Le Gay Brereton (*Agr. Gaz. N.S.W.* vol. xxv. p. 310).—A useful summer spray for aphids and American blight is prepared by immersing 100 lb. of tobacco stalks in water. Add 3 lb.

of washing soda. Heat to boiling, taking care to prevent the tobacco from rising to the surface. Allow to cool. After 24 hours run off the extract and add sufficient water to make 300 gallons of liquid. The wash does not keep long. A powerful spray must be used.—S. E. W.

Tomato, Disease of, in Louisiana. By C. W. Edgerton and C. C. Moreland (*U.S.A. Exp. Stn., Louisiana, Bull.* No. 142; Oct. 1913).—A popular bulletin to help tomato-growers in identifying and controlling the various diseases of tomato plants, more especially the tomato wilt (*Fusarium Lycopersici*) and early blight (*Alternaria Solani*). These two diseases seem to be doing considerable damage in Louisiana.

Fusarium Lycopersici lives over from year to year in the soil, and is consequently very difficult to control. The disease affects the vascular tissue of the root and stem, the growth is stunted, the leaves turn yellow, and the plant eventually dies.

Rotation of crops is advised, also extreme care in removing and burning all infected plants or parts of plants.

Alternaria Solani, being a disease of leaves and fruit, can be controlled by spraying with Bordeaux mixture.—D. M. C.

Transpiring Power of Plants. By A. L. Bakke (*Jour. Ecol.* vol. ii. No. 3, pp. 145-173; 2 figs.).—In this important paper the author describes a method for determining the transpiring power of different plants by means of standardized cobalt-paper. He gives tables of results obtained by this method in the study of the daily march of transpiration, the relation of position on the plant and age of the leaves to their transpiring power, the relation of night to day transpiring power, and so on, for a large number of plants experimented with. The method gives remarkably interesting results, but perhaps the most important outcome of his studies is the conclusion that the method offers an adequate and simple means of classifying plants in a scale of xerophytism or of mesophytism according to their index of foliar transpiring power, while experiments made with cultivated plants indicate that the method may be of great practical value in determining the relative resistance to drought of different crops or different varieties utilized in horticulture and agriculture—a problem which the author considers might be better approached by this method than by any other as yet devised. For instance, the magnitude of the foliar transpiring power, as thus determined, may prove valuable in predicting the need of irrigation long before the occurrence of actual wilting.—F. C.

Trees, The Artificial Production of Vigorous. By A. Henry (*Jour. Dep. Agr. Tech. Ins., Ireland*, xv. 1914; plates and figs.).—The author describes the method of crossing such trees as poplars, walnuts, ash, and the like, and comments upon the extraordinary vigour of some of the hybrids which have been raised, especially among poplars (see p. 341, and *Populus* \times *generosa*, p. 636).

F. J. C.

Trenching. By the Duke of Bedford, K.G., F.R.S., and Spencer U. Pickering, M.A., F.R.S. (*Woburn, 14th Rep.*, 1914, pp. 33-36).—Deals further (see 5th and 9th Reports) with the bastard trenching of arable land without the addition of manure or other matter, and the same conclusion is arrived at, namely, that on the average the effect is insignificant and practically *nil*.—A. P.

Variability in *Stellaria graminea*. By A. S. Horne (*New Phyt.* vol. xiii. No. 3, pp. 73-82; 2 figs.).—The author describes some interesting variations in the flower of *Stellaria graminea*, studied mainly in an uncultivated field at the R.H.S. Gardens at Wisley. He found that the corollas of hermaphrodite individuals varied in size, whereas those of male-sterile individuals did not vary in this manner; on being transferred to a different and artificial environment the corollas of the hermaphrodites diminished in size, whereas those of the male-steriles showed no change. Individuals of all grades were found varying with respect to the following characters: long and short petals, wide and narrow petal-lobes, long and short stamens, fertile and sterile stamens. Femaleness is usually associated with corollas of small or medium size, never with corollas of the largest size, while hermaphroditism is usually associated with corollas ranging from medium to large size. Intermediate individuals were found with some stamens resembling those of hermaphrodite individuals and others resembling those of male-sterile individuals; such individuals had medium-sized corollas; hence individuals with a corolla of medium size may be either hermaphrodite or male-sterile, or belong to the intermediate series. The author suggests a working theory to explain these phenomena. It is possible to sort out from the plexus forms which are definitely male-sterile and hermaphrodite respectively; individuals of both kinds set good seed, and hence have probably been pollinated. The hermaphrodite individuals cross-pollinate among themselves, since the flowers cannot of course receive pollen from male-steriles; but the latter, if pollinated, receive pollen from hermaphrodite individuals, hence the conditions obtain for Mendelian hybridization. The author relates his observations with those made by de Vries and Gates on *Oenothera* and by Salaman on the Potato, and promises further experimental work.—F. C.

Vegetation in Mountain Valleys. By Francis Ramaley (*Bot. Gaz.* lvii. pp. 526-528, June 1914).—The author found that in a small glaciated valley, at 9000 feet altitude in the Rocky Mountains, the percentage of ground bare of living or dead vegetation showed great variation at different seasons.

Thus on May 30 from 50 to 80 per cent. of the ground in dry grassland was bare in seventeen selected squares.

The growth of the new vegetation had by June 28 or July 12 resulted in covering all except from 10 to 20 per cent. of the ground.

When meadow grassland was examined in the same way, it was found that in May only 25 to 45 per cent. was free of plants, and on

July 12 either all the ground was covered or only 10 per cent. free of vegetation.

Introduced weeds obtain a footing only in the already closely-grown meadow, not in the open dry grassland.—*G. F. S. E.*

Vegetation of Natal. By J. W. Bews (*Jour. Ecol.* vol. ii. No. 3, pp. 206-7; 8 plates).—This is a summary of a longer account published by the author in the *Annals of the Natal Museum*, the plates from which are here reproduced. In considering the factors influencing the plant-communities of the area dealt with, the Pietermaritzburg district, the author lays stress on the influence of topography and physiography, while the recent important concepts of stable and unstable habitats and of growth-forms are emphasized in his classification of these communities. The vegetation of the area is divided into seven natural plant-formations and an eighth consisting of plantations, mainly of wattle (*Acacia*). The first and much the most extensive is the veld formation, dominated by grasses and divided into high and low veld, the latter having a deeper but less well-aerated soil than the former. The bush formation occurs in the high veld region, the bush itself consisting of a forest of two layers of trees, mostly evergreen, with abundant lianas, some epiphytes, but rather scanty undergrowth; where the bush is cleared the area becomes occupied by veld grasses, and on the margin of the bush formation there is a zone of transition to veld, where, according to the conditions as to protection or the occurrence of fires, &c., one formation passes into the other. The thorn veld formation occurs in the low veld region, and would be more extensive but for the periodic fires. The rocky hillside formation consists of scrub, which is developed in the high veld region and is intermediate between bush and thorn veld; it is characterized by aloes, spurges, &c. The alpine plant formation occurs on the flat mountain-tops and consists of species not found at lower altitudes, though on the mountain-sides the veld formation may extend right to the top. The vlei (marsh) formation occurs mainly along the streams, and includes several associations varying with the degree of moisture or the aeration or otherwise of the water, the drier parts showing a transition to veld. The stream and river formation proper is a moist zone, like the last, but has characteristic trees and shrubs. The plates accompanying the description are admirable pictures of the vegetation of the colony, which presents great variety as one ascends from the subtropical vegetation of the coast, with its mangrove vegetation, to the high altitudes of the veld and the Drakensberg.—*F. C.*

Wilting Coefficient of the Soil. By V. H. Blackman (*Jour. Ecol.* vol. ii. No. 1, pp. 43-50).—The author presents a critical review of certain recent work on the soil which promises to be of great importance to the agriculturist and horticulturist as well as to the ecologist. As is well known, owing to the physical conditions in which the water is held in the soil, only a portion of the water actually present

can be used by the plant for its life processes, and since the amount of available soil-water is often decisive for or against a plant's healthy growth, and even its existence, it becomes of great importance to develop a method which will give some measure of this available water. The method generally used is the indirect one of finding the amount of water in the soil when the plant wilts ; this amount is known as the wilting coefficient of the soil in question, though it really represents the non-available water. Since the wilting coefficient depends upon a want of balance between the rates of absorption and water-loss, and these two processes are readily affected by external conditions, this coefficient varies greatly not only with different soils and different plants, but also with the external conditions. Briggs and Shantz, investigating the relation of the wilting coefficient to soil constitution, came to the somewhat surprising conclusion that for any given soil the wilting coefficient is a constant quantity, independent of the kind of plant or of the external conditions under which it was grown. Caldwell found that this coefficient had different values in experiments made with the same plant under different conditions as to shade and moisture, and therefore showing different rates of transpiration. Prof. Blackman points out that the apparently conflicting results obtained agree in some respects, that the Briggs and Shantz rule cannot be accepted in the generalized form put forward by them, but that it does hold good for low rates of transpiration, so low that probably they fall below those occurring in most plants under natural conditions. But while the trend of recent work has been to show that there is no simple wilting coefficient, it has been shown that the moisture content of the leaves of a given plant gives a simple and satisfactory measure of the plant's condition with respect to water ; the water content of turgid leaves of about the same age varies only within narrow limits for a given species, and this also holds good for the foliar water content at the stage of permanent wilting. The author then discusses the relation of the wilting coefficient to different types of soil, since it is impossible to consider the water content of a soil apart from its physical composition and retentiveness ; and finally he points out the important problems in connexion with the water relations of soil and plant which urgently require investigation.—F. C.

ERRATA AND CORRIGENDA.

Page 135, line 6, for *kalomikta* read *Kalomikta*.

„ 163 „ 5 „ *Arcenthobium* read *Arceuthobium*.

„ 239 „ 15 „ *Linneus* read *Linnaeus*.

„ 257 „ 5 „ *of* read *of*.

„ 263 „ 4 „ 1900 read 1899.

„ 322 „ 2 „ *vulneraria* read *Vulneraria*.

„ 341 „ 38 „ *deltoidea* read *deltoides*.

„ liv „ 32 „ *Moupinense* read *moupinense*.

EXTRACTS FROM THE PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 13, 1914.

Field-Marshal the Right Hon. Lord GRENFELL, G.C.B., G.C.M.G.,
[in the Chair.

Fellows elected (73).—S. R. Beagle, Mrs. J. F. C. Bennett, F. W. Beresford, The Hon. Mrs. T. W. Best, Miss J. C. Birtill, J. M. Black, Mrs. Blackett-Old, G. Bliss, Miss E. E. R. Bradford, Mrs. J. L. Busk, W. H. Coldwells, Miss Florence E. Cuff, Miss C. Davidson, Mrs. Aylmer Digby, Mrs. Dobell, M. J. Drake, Mrs. E. J. Edwards, E. R. Finlayson, A. J. Freeman, Mrs. G. J. Gibbs, Mrs. W. Gibbs, F. G. Gill, Miss C. B. Glegg, Mrs. H. Sharpe Gordon, Mrs. C. W. Gordon, E. C. Goulton, Edmund Griffith, Mrs. N. Harris, A. R. Harwood, Mrs. D. M. Hawkins, Mrs. G. E. Hewett, Miss Holland, Miss N. E. Hunter, Mrs. G. Hurd-Wood, R. W. Jones, Miss E. Kendall, H. D. King, H. B. Leigh, George Liffen, T. A. Lofthouse, J. I. Lowles, W. C. M'Donnell, A. C. Marshall, Lady Mond, H. W. Noble, Miss D. Offer, Mrs. J. W. R. Parker, Mrs. G. Payne, Mrs. R. H. Percival, Mrs. Perkins, W. Poyser, C. Weaver Price, Miss A. C. Rake, R. H. Rawson, Miss G. Robins, Latimer Savile, J. Seabrooke, Miss E. Simpson, G. R. Smith, A. V. Stewart, Miss E. Stewart, Dr. F. Stoker, The Hon. R. Strutt, E. E. Sutton, Hyo Togo, D. C. Trier, W. H. Turner, The Hon. Mrs. K. Turnour-Fetherstonhaugh, Mrs. L. B. Vacher, W. Warburton Wingate, E. J. Wootten, H. S. Wyndham, Mrs. A. C. Yate.

Fellow resident abroad (1).—H. A. C. Goodacre (U.S.A.).

Society affiliated (1).—St. Albans and Dist. Hort. Soc.

GENERAL MEETING.

JANUARY 27, 1914.

The Hon. J. H. TURNER in the Chair.

Fellows elected (64).—W. A. Adams, Broughton Addy, M.D., Mrs. K. B. Alder, Gordon Anketell, Mrs. C. H. Bedford, W. C. Blaxill, Mrs. M. C. Brown, Miss Constance Bullen, Miss Burbidge, Mrs. J. Campbell-Bannerman, Miss F. M. Chave, Henry Cherry, Mrs. A. Churchill, Miss J. Cooper, Miss Cozlett, Miss M. E. H. D'Arcy, Mrs. H. Dumergue,

Mrs. Robert Dunthorne, Mrs. A. G. G. Elton, Robert Ewing, J.P., A. R. Faulkner, Mrs. James Fowler, Miss L. S. Fraser, Frank Frost, Miss I. N. Garnett, R. D. Graham, Mrs. Malcolm Green, Miss C. L. Gribble, T. F. Harding, Miss E. M. Hare, Miss May Heron, Mrs. Hunter, Miss Florence D. Jebb, T. L. Jones, Mrs. Alfred L. Joy, A. Kennedy, Mrs. Frank Kershaw, F. J. Lewis, Mrs. S. H. Lowe, Mrs. E. Lucas, A. C. McCorquodale, Mrs. Mackenzie, H. J. Martin, N. H. Martin, F.L.S., Clive H. Meares, Mrs. Aylett Moore, J. Ward Nicholson, Mrs. E. T. Oliver, Evan Owen, E. Round, Mrs. Oswald Smithers, Mrs. Arthur Spyer, Sir Alexander R. Stenning, J. J. Teasdale, Lady Tyler, Major B. G. Van De Weyer, Mrs. Vaughan, Mrs. W. Walker, Mrs. E. Lee Whar-ton, H. Whitley, Mrs. J. Henry Whittle, G. H. Wilkinson, A. T. Willett, J. Snell Wood.

Fellows resident abroad (2).—E. W. Benson (B.C.), K. J. N. Singh (India).

Associates (2).—A. Alderman, Miss C. R. Swain.

Affiliated Societies (2).—Deal, Walmer, and Dist. Hort. Soc., Mount Pleasant Hort. Soc.

A lecture on "Some Aspects of American Forestry" was given by Prof. W. Somerville, F.L.S. (see p. 1).

ANNUAL GENERAL MEETING.

FEBRUARY 10, 1914.

Chairman—Sir HARRY J. VEITCH, F.L.S., V.M.H.

The Minutes of the Annual Meeting of February 11, 1913, were read and signed.

A letter was read from F.M. Lord Grenfell regretting his inability to be present in the Chair at the first Annual Meeting after his election as President, owing to his enforced attendance on the King at the opening of Parliament.

The CHAIRMAN referred to the loss the Society had sustained by the death of their late President, Sir Trevor Lawrence, and moved the following Resolution, which was seconded by Mr. J. GURNEY FOWLER, Treasurer, and carried in silence, all up-standing in their places :

"The Fellows of the Royal Horticultural Society in Annual Meeting assembled this 10th day of February, 1914, desire to express their great regret at the death of their late President, Sir Trevor Lawrence, Baronet, K.C.V.O., V.M.H., &c.

"They wish also to put on record their profound appreciation

- (1) Of the most eminent services rendered by Sir TREVOR to the Society during the very difficult days which beset the commencement of his Presidency in 1885 and the years that followed ; and also
- (2) Of the patience which he showed during the gradual building up again of the Society during the middle period of his office ; and, lastly,

- (3) Of the tact and wisdom with which he directed the Society's affairs during the later years of its prosperity—a prosperity due in no small degree to the personality of its President."

It was proposed by Sir HARRY VEITCH, V.M.H., and seconded by J. GURNEY FOWLER, Esq., Treasurer, and carried, "That the above Resolution be entered in the Minute Book of the Society, published in the JOURNAL, and communicated to Lady Lawrence and to Sir William Lawrence, together with the Address which had been prepared by the Council for presentation to Sir Trevor, but was delayed by his illness and death."

Fellows elected (86).—Hon. Lady Abdy, Miss B. Acland, Mrs. H. E. Baker, Mrs. E. P. Barry, Mrs. Bartholomew, Mrs. F. C. Bennett, Mrs. F. T. Higgins Bernard, Miss I. A. E. Berrow, John Birch, Mrs. Azim Birch, Mrs. E. M. Borough, S. J. Brampton, Mrs. E. Marsland Brooke, Arthur Brown, Mrs. Kinnear Browne, Miss E. M. Burnett, Mrs. F. Burrows, Thomas Carritt, Mrs. Center, Mrs. W. Trested Clark, W. Clarke, Miss N. Cooper, A. Wynne Corrie, W. Crellin, T. Cundell, S. R. Davie, Miss S. Drummond, Mrs. L. Egerton, Miss A. England, Miss M. C. Footner, Mrs. F. W. Frank, Sigismund Goetze, T. Grainger, J. Hacking, Miss M. H. Hanmer, Lt.-Col. A. E. Hatch, Mrs. R. H. Hill, Mrs. Hine, Sydney Hobson, Mrs. Seymour Hughes, Campbell G. Hulton, F. B. Jarvis, Miss L. Jenkins, A. Johnson, S. Kaye, W. Killik, E. Lamb, Mrs. J. O. Laurence, H. P. Leschallas, R. E. Loder, K. McAlpine, Mrs. Hodson Mackenzie, Mrs. Maile, Miss Dyce Nicol, A. Nottage, Mrs. Paddon, Lady Victoria Percy, Miss Phillips, P. D. Poole, J. Powell, Mrs. W. H. Prescott, Mrs. H. Ransom, G. Reid, B. J. Ringrose, C. M. Robertson, Mrs. H. D. Rolleston, T. Rotheroe, Miss L. Russell, H. B. St. George, Mrs. C. P. Sandberg, Mrs. M. H. Scott, Mrs. W. Knowsley Sibley, Mrs. E. Spicer, Mrs. K. A. Tower, Mrs. E. Trier, Mrs. C. H. Tritton, G. W. R. Tupper, Mrs. M. S. Turner, R. V. Vassar-Smith, D.L., J.P., H. E. Ward, W. G. Whetter, Mrs. H. Wigram, G. C. Williams, Mrs. M. Williams, Miss Woodcock, Mrs. A. Woods.

Fellows resident abroad (5).—M. G. Desai (India), J. Fraser (U.S.A.), H. Martin Leake, M.A., F.L.S. (India), R. D. K. Mehr (India), Mrs. T. Ward (China).

Associates (7).—C. Cassidy, F. Denyer, E. J. Hannington, W. H. Johns, Miss H. Joseph, G. Leggett, W. J. Reed.

Affiliated Societies (2).—Aylesbury Horticultural Society, Hazlemere Terriers and Dist. Hort. Soc.

The CHAIRMAN moved the adoption of the Annual Report. This was seconded by the Treasurer and carried.

The following names of President, Vice-Presidents, Members of Council and Officers, having been duly proposed and seconded, and the list circulated in accordance with By-law 74, and no alternative names having been proposed, were declared by the Chairman to be elected :

As President.—Field-Marshal The Right Hon. Lord Grenfell, G.C.B.,¹ G.C.M.G.

As Vice-Presidents.—The Duke of Bedford, K.G., F.R.S., the Rt. Hon. Joseph Chamberlain, F.R.S., the Rt. Hon. The Earl of Ducie, F.R.S., the Right Hon. Lord Rothschild, Leopold de Rothschild, Esq., C.V.O., Sir John T. Dillwyn-Llewelyn, Bt., D.L., J.P., V.M.H.

As Members of Council.—Field-Marshal The Right Hon. Lord Grenfell, G.C.B., G.C.M.G., the Rt. Hon. Colonel Mark Lockwood, M.P., Sir Daniel Morris, K.C.M.G., J.P., D.Sc., V.M.H.

As Treasurer.—Mr. J. Gurney Fowler.

As Secretary.—The Rev. W. Wilks, M.A., V.M.H.

As Auditor.—Mr. Alfred C. Harper.

Sir DANIEL MORRIS, K.C.M.G., then spoke on the following motion, notice of which had been issued with the notice convening the Annual Meeting :—

“ That the Council of the Society be requested to create a Special Trust Fund to carry on and augment the Society’s work at Wisley, and this Meeting would approve of a part of the present Surplus Funds of the Society being allocated to that purpose.”

Sir Daniel briefly outlined the circumstances under which the Gardens were held in trust for the Society, and called attention to the capital and revenue expenditure already undertaken at Wisley. He referred to the many criticisms which had lately appeared in the Horticultural Press and elsewhere, concurrently with the meetings of a special Committee which had been appointed by the Council to consider in what way the Society could still further and best assist the interests of Horticulture.

He said that, in response to a circular sent out by the Council in the early part of 1913, more than fifty replies had been received, making various suggestions. These had all been carefully considered by the Committee and had led up to a report to the Council focusing attention upon the desirability of extending the work both on the practical and scientific sides of the Society at Wisley, and on the influence and prestige the Society would secure by a more complete and definite organization there.

The developments suggested by the report would involve a further expenditure of at least £2,500 a year, and a further capital outlay on buildings ; and if this additional money was to be expended there was urgent need for the formation of a Trust, so that the continuance of the work might be made independent of any future fluctuations in the Society’s finances.

Mr. CUTHBERTSON seconded the resolution to the effect that a Trust Fund should be created to augment the Society’s work at Wisley in scientific research and horticultural education, and in the more exact organization of the trials of varieties of flowers and vegetables.

This was supported by Mr. MAY, Professor BAYLEY BALFOUR, F.R.S., and Mr. SHEA.

On being put to the vote, the motion was carried *nem. con.*

REPORT OF THE COUNCIL FOR THE YEAR 1913.

1. **Sir Trevor Lawrence.**—The year 1913 began with the shadow, as it were, of gloom cast over it by the resignation of our President, and it has ended in the great sorrow of his death, which took place on December 22, within a few days of his 82nd birthday.

Seldom, if indeed ever, has a Society been served by its President so long and so ably as the Royal Horticultural Society has been served by Sir Trevor Lawrence. Elected to the President's seat in the very difficult days of the Society's history in 1885, Sir Trevor has held the reins ever since, up to the spring of 1913, and has guided the Society, with steadily increasing progress, out of the quagmire of difficulties in which he found it into its present state of prosperity. Whilst thus deeply appreciating his services, most of the Members of the Council have been in too close a touch with the President as contemporaries to be able to realize how great and comprehensive those services have been, and it is only the rising generation of horticulturists, who in the future investigate the history of the Society, who will behold in clear light the vast influence and benefit to Horticulture of the long and uninterrupted Presidency of Sir Trevor Lawrence.

2. **New President.**—To fill the void left by Sir Trevor's resignation was the difficult task which the Council had to perform in the spring of 1913, and fortunate indeed do they consider themselves in having prevailed on Field-Marshal Lord Grenfell to accept the office.

3. **New Committees.**—The work of the Society has increased to such an extent that, in addition to the Parliamentary Committee formed towards the end of 1912, the Council have felt it necessary to appoint two new Committees—namely, (1) The Diploma Committee, and (2) The Research Committee.

The Diploma Committee is entrusted with the organization of the Examinations for the National Diploma in Horticulture, which has been established by the Society with the approval and co-operation of the Board of Agriculture. The first examination will take place in June 1914.

The Research Committee was appointed to examine the large number of suggestions for the extension of the Society's work which are constantly being made, and to advise the Council on any reasonable ways in which the Society might assist and advance the more scientific aspects of horticulture. A very important report has been drawn

up by this Committee, and, if it is found practicable to carry out its recommendations, there is every prospect of great developments taking place in the Society's work in the immediate future. This Report, which was only laid before the Council on December 9, will require much careful thought, for the scheme is of such magnitude and complexity, and touches so many different interests, that its mere consideration must of necessity take a considerable time before even an outline of it can be announced, so that for the present no more can be said beyond recording the fact. A new Committee has been formed to advise on the details of the Report.

4. **Orchid Register.**—It has been decided to establish a Register of Orchids; not only, but specially, for the sake of recording the parentage of hybrids and of securing their correct and permanent nomenclature. Mr. R. A. Rolfe has been appointed Official Recorder. The Register will be carried back as far as possible by careful examination of old documents, and the Council hope that Orchid Growers having private records of genera, species, and hybrids, will assist the compilation by lending them to the Society to be copied for this purpose. The immediately pressing work of the Recorder, however, will be the entering up on the Register of every new Orchid shown, with particulars of its parentage, raiser, owner, &c., as far as is known.

5. **Parliamentary Committee.**—The Parliamentary Committee appointed in 1912 have had the following subjects under their consideration—namely, (a) the proposed Government Seed Testing Station, (b) the Subsidies given by Government to Co-operative Organizations, which are alleged to undersell Retail Traders, (c) Railway Rates and Conditions, and (d) the Sale of Wet Coke by weight. On the two former points the Council have addressed memoranda to the Board of Agriculture; and on the question of Coke, Sir Albert Rollit has kindly undertaken to bring the matter before the Board of Trade on the Council's behalf.

6. **Wisley Gardens.**—The planting of the Rock Garden is still proceeding, but it is necessarily a matter of time before so large an area can be well clothed with plants, especially considering the slow-growing nature and rarity of some.

The Alpine House is proving a valuable addition to the Rock Garden, and many Fellows visit it during the earlier months of the year.

The erection of an Orchard House is at this moment proceeding. The House is being constructed with very great care in order that exact and delicate Experimental and Research work concerning Fruit Trees may be properly undertaken within it.

A Water Lily tank, fitted with hot-water pipes, is also under construction for the accommodation of Blue Water Lilies kindly presented by Mr. Leopold de Rothschild.

7. **Pelargonium Nomenclature.**—The Council are indebted to Mr. J. Fraser for his researches in the correct naming of the Scented-leaved or Cape Pelargoniums, and for drawing up a list of their synonyms. The list comprises 124 species or distinct varieties, but further plants are still under examination.

8. **Trial of Tulips.**—The Council issued an invitation to Growers of Tulips to send bulbs to Wisley, that their correct nomenclature might be recorded and a list of synonyms made. Over 4000 parcels of bulbs have been received and planted, and a committee of Dutch and English growers has been appointed for the work.

9. **Spraying and Sundries Trials.**—A useful trial of Spraying Apparatus was conducted at Wisley, in April, when awards were made.

The new system of trial of Horticultural Sundries, introduced this year as a means of determining the awards which such subjects as garden rollers, mowing machines, tools, insecticides, &c., should receive, has been satisfactory and will be continued.

10. **Mr. Smith's Resignation.**—Mr. Arthur C. Smith, the Assistant Superintendent, resigned after six years of useful service. Mr. Blakey, who had been Chief Foreman, was appointed his successor, and Mr. Braddy has been raised to Mr. Blakey's position, with special charge of the Fruit Department.

11. **Dahlia Trial at Cardiff.**—Mr. Reginald Cory most kindly placed his garden at Duffryn, near Cardiff, at the Society's disposal for a trial of Dahlias decorative to a garden. The Council invited the co-operation of the National Dahlia Society in this trial, which co-operation was most cordially given, and the delegates from the two Societies inspected between seven and eight thousand plants, representing nearly a thousand distinct varieties, out of which 291 were selected as being desirable for garden ornamentation. The full report of the trial will appear in the Journal of the Society.

12. **Chelsea Show.**—The past year has seen the first of the new series of Spring Shows at the Royal Hospital Gardens, Chelsea; the result in every way justified the action of the Council in transferring the Show from the Temple Gardens to Chelsea, and it is confidently hoped that Fellows will co-operate with the Council in encouraging the attendance of visitors, so that the Show may be a success in the future.

The Council greatly appreciate the courtesy received from the Commissioners of the Hospital in helping them to meet the many difficulties inseparable from the organization of a Show of such magnitude.

13. Holland House Show.—For the second time only, in a period of ten years, the Holland House Show was favoured with beautiful weather, and it was pronounced to be the most pleasant Summer Show the Society had held.

14. Shows open one hour later.—A communication having been received from Fellows in the City, asking that the Shows at Vincent Square might remain open one hour longer, the Council, after consulting the most frequent Exhibitors, decided to adopt the suggestion. Fellows will accordingly find the later hours set forth on their Annual Tickets.

15. Cups.—A standard pattern (in four sizes) for the R.H.S. Cups was adopted in 1913, and was found to be very popular with Exhibitors. A Cup of a different pattern has been chosen for 1914, an illustration of which will be found in the "Book of Arrangements." Mr. E. H. Davidson has again very kindly presented a Cup for the best *Cattleya* at the Chelsea Show, and Mr. Cory a Cup for the most meritorious Seedling *Dahlia* in the trials, which he is kind enough to allow the Society to continue for a second year at Duffryn, Cardiff.

16. New Challenge Cups.—The Council have to thank Lady Algernon Gordon-Lennox for a large Silver Challenge Cup presented for award at the Holland House Show for Hardy Flowers. They have also to thank Mr. Reginald Cory, not only for the great kindness shown in placing his garden at their service for the *Dahlia* Trial, but also for his hospitality to their delegates and for his gift of a seventy-five guinea Challenge Cup for a group of *Dahlias* for Garden Decoration at the Society's Show in September.

The Council have further accepted from Messrs. Clay a £75 Silver-Gilt Challenge Cup for "A Rose, not in commerce, possessing the true old rose scent." This Cup will be offered for the first time at the 1914 Holland House Show, and Messrs. Clay will furnish the Society with a smaller permanent Cup to present to the winner when the Challenge Cup is returned.

The Council have established a Silver Challenge Cup, value thirty guineas, to be awarded at the R.H.S. Daffodil Show. As a well-deserved compliment to by far the greatest raiser of hybrid seedlings of modern times, it is to be called the "Engleheart Cup." In 1914 it is offered at the R.H.S. Daffodil Show, on April 15 and 16, for the "Twelve Best Seedlings, distinct, which have not yet been put into commerce."

The Council have accepted the Trusteeship of the Barr Memorial Cup, founded in memory of the late Mr. Peter Barr, and its award will be made on the recommendation of the Narcissus Committee.

17. **Pritzel's Index Iconum Botanicarum.**—The Council have also accepted the Trusteeship of the sum of £250, voted by the Directors of the International Horticultural Exhibition, 1912, for the revision of Pritzel's Index Iconum Botanicarum. The Council have also received a kind gift of £100 from the Veitch Memorial Trustees and have themselves agreed to supplement this, and all other gifts which may be received for the purpose, by £250 annually until the fund is sufficient to pay for the revision proposed.

18. **Primula Conference.**—A very successful Conference on Primulas was held on April 16, when Sir John T. Dillwyn Llewelyn, Bt., V.M.H., took the Chair. Papers were read by Professor I. Bayley Balfour, F.R.S., V.M.H., Dr. John MacWatt, Mr. Reginald Farrer, Mr. W. G. Craib, M.A., and Miss Gertrude Jekyll, V.M.H. A report of the Conference appeared in the JOURNAL of the Society, volume xxxix. page 98; and it is also being issued separately, in book form, price 1s. 6d.

19. **Saxifrage Conference, 1915.**—It has been decided to hold a Conference on Saxifrages in 1915. Mr. Milne-Redhead has generously presented the Society with his MS. list containing nearly 1000 entries of Species, Varieties, and Synonyms. Further co-operation in this direction will be most gratefully accepted.

20. **Daffodil Year Book, 1913.**—A Daffodil Year Book was issued by the Society in August and found a ready sale, the copies available being rapidly bought up. The Council are greatly indebted to the Rev. J. Jacob for his assistance.

21. **Lawrence Medal for 1913.**—The Lawrence Medal for 1913 has been awarded to Mr. G. F. Moore, of Bourton-on-the-Water, for his Exhibit of Orchids, on January 7, 1913.

22. **Deputations.**—During the year Deputations from the Society have visited the Shows held at Truro, Bristol, Cardiff, Birmingham, Kendal and Maidstone, reports of which will be found in the JOURNAL.

An invitation has been received from the Carlisle and Cumberland Horticultural Association, and has been accepted, for a Deputation in August next.

23. **Grapes to Glasgow.**—An Exhibit of Wisley-grown Grapes was sent to the Glasgow and West of Scotland Horticultural Society's Show in September, where the fruit excited the greatest admiration and was awarded a special Gold Medal.

24. **Lindley Library.**—Purchases of very rare and valuable books have been made, including : Redouté, " Les Roses " ; Volkamer, " Nürnbergische Hesperides " ; Kerner, " Les Melons " ; Fitzgerald, " Australian Orchids " ; Gerarde, " Catalogus Arborum " ; Berlese, " Iconographie du Genre Camellia " ; Martyn, " Historia Plantarum Rariorum " ; " The Compleat Florist " ; Dykes, " The Genus Iris " ; Pfeiffer and Otto, " Abbildung und Beschreibung Blühender Cacteen " ; Nyman, " Conspectus Florae Europaeae."

25. **Douglas' Journal.**—The task of editing the Journal kept by Douglas when he was travelling in America nearly 100 years ago as the Society's collector, has taken far longer than could have been anticipated, the writing being in places very difficult to decipher ; but it is hoped to publish it early in the ensuing summer.

26. **Plant Collector.**—The Council have arranged to share part of the expenses and of the " finds " of a Collector, who is starting for the high lands between China and Tibet.

27. **New Honorary Fellows.**—The Council felt much pleasure in appointing as Honorary Fellows of the Society Mr. H. W. Adnitt and Mr. W. W. Naunton, in recognition of the remarkable ability and success with which for a long number of years they have acted as Co-secretaries of the Shrewsbury Show.

28. **Rules for Judging.**—" The Rules for Judging " are being revised and will be ready for issue in the course of a few weeks. Considerable additions to former issues will be found to have been made, including a new " Code for the Judging of Cottage and Allotment Gardens."

29. **R.H.S. Gardeners' Pocket Diary.**—The sale of the " R.H.S. Gardeners' Pocket Diary " for 1913 exceeded the issue of previous years, and many are the letters of appreciation received from all parts in testimony of its usefulness.

30. **Obituary.**—It is with regret that the Council have to record the death of the following Fellows :—The Duchess of Northumberland, the Earl of Pembroke, the Countess Cowper, the Dowager Countess of Kenmare, Viscount Tredegar, Lady Darling, Lady Dorothy Neville, Colonel Archer Houblon, Alfred Austin, Esq., J. Martin Sutton, Esq., Alfred Tate, Esq., W. T. Hindmarsh, Esq., A. H. Kingsmill, Esq., J. S. Moss, Esq., H. J. Pearson, Esq., a past Member of the Council, and Messrs. Amos Perry, Robert Sydenham, Edward Webb, and A. H. Kent.

31. **Annual Progress.**—The following table shows the Society's progress in regard to numerical strength during the past year :—

LOSS BY DEATH IN 1913.				FELLOWS ELECTED IN 1913.			
		£	s. d.			£	s. d.
Hon. Fellows	4	0	0 0	Hon. Fellows	5	0	0 0
Life „	9	0	0 0	4 Guineas	3	12	12 0
4 Guineas	2	8	8 0	2 „	750	1,575	0 0
2 „	79	165	18 0	1 „	789	828	9 0
1 „	90	94	10 0	Associates	74	38	17 0
Associates	2	1	1 0	Affiliated Societies	35	36	15 0
				Commutations	17		
				=£411 12s. 0d.			
	186	£269	17 0				
					1,673	£2,491	13 0
				Deduct Loss		1,227	9 0
LOSS BY RESIGNATION, &c.				NET INCREASE IN INCOME			
		£	s. d.			£	s. d.
4 Guineas	2	8	8 0				
2 „	214	449	8 0	New Fellows, &c.		1,673	
1 „	451	473	11 0	Deaths and Resignations		890	
Associates	24	12	12 0				
Affiliated Societies	13	13	13 0	NUMERICAL INCREASE		783	
				Total on December 31, 1912		13,385	
	704	£057	12 0				
TOTAL LOSS	890	£1,227	9 0	Total on December 31, 1913		14,168	

32. **Committees, &c.**—The Society owes a constantly recurring debt to the Members of the Standing and Special Committees, Chairmen, Judges, Writers of Papers for the JOURNAL, Compilers of Abstracts, Reviewers, Lecturers, and the several Examiners, who, during the past twelve months, have done so much to contribute to the Society's usefulness, and to help to maintain its high standing among the practical and scientific institutions of the world.

The Council also acknowledge their obligations to the Press for their invaluable assistance in reporting upon, and calling attention to, the work of the Society.

By Order of the Council,

W. WILKS,

Secretary.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S W.

January 1, 1914.

Dr.

ANNUAL REVENUE & EXPENDITURE ACCOUNT

To ESTABLISHMENT EXPENSES—

	£	s.	d.	£	s.	d.
Ground Rent	690	0	0			
Rates and Taxes	471	4	10			
Water Rate	81	16	4			
Electric Light	240	7	6			
Gas	43	0	3			
				1,526	8	11
Salaries and Wages	2,050	13	10			
Printing and Stationery	1,412	14	4			
Postages	618	3	4			
Fuel	58	16	0			
Professional Fees	119	14	0			
Gratuities	106	11	0			
Repairs and Renewals (including £150 for Hall Painting)	637	13	2			
Miscellaneous Expenses	225	10	7			
				5,229	16	3
„ INSURANCES				90	6	2
„ JOURNAL, PRINTING AND POSTAGE				3,769	4	9
„ WISLEY SCHOLARSHIP. GIVEN BY THE SOCIETY				25	0	0
„ STAFF PENSION	458	19	8			
Less contributed by the Staff, as per scheme	221	0	11			
				237	18	9
„ SHOWS and MEETINGS—						
Chelsea Show	3,365	10	5			
Holland Park Show	1,513	13	9			
Autumn Fruit and Vegetable Shows	413	6	0			
Labour, Floral Meetings and Conferences	253	4	2			
Expenses, do. do.	305	15	7			
(Including Hessian, Vases, Timber, &c., £269 11s. 2d.)						
Council, Committee & Deputation Expenses	344	10	5			
Painting Orchid Certificates	57	0	0			
				6,253	0	4
„ PRIZES and MEDALS—						
Awarded at Society's Shows	539	10	7			
Do. by Deputation at other Shows	264	6	0			
				803	16	7
„ WISLEY GARDENS—						
Salaries	497	11	8			
Rates and Taxes	87	11	9			
Labour	1,010	13	1			
Garden Implements	87	19	7			
Loam and Manure	143	11	6			
Repairs	198	18	10			
Fuel	283	18	8			
Miscellaneous Expenses	157	9	5			
Trees and Shrubs	37	18	8			
Rock Garden Plants, &c.	25	19	8			
				2,531	12	10
„ COST of GROWING, PACKING and DISTRIBUTION of PLANTS to FELLOWS				295	17	4
„ LABORATORY, WISLEY—						
Salaries	512	10	0			
Miscellaneous Expenses	136	16	10			
				649	6	10
Prize Fund	13	1	7			
Less Donation	£5	0	0			
„ Dividend (Nicholson Memo- rial Fund)	6	2	2			
				11	2	2
				1	19	5

Carried forward . £21,414 8 2

FOR YEAR ENDING 31st DECEMBER, 1913.

Cr.

	£	s.	d.	£	s.	d.
By ANNUAL SUBSCRIPTIONS				19,918	16	0
" ENTRANCE FEES				454	13	0
" DIVIDENDS AND INTEREST	2,873	14	8			
" Do. do. DAVIS TRUST	50	11	0			
				2,924	5	8
" SHOWS AND MEETINGS —						
Chelsea Show	3,453	3	6			
Holland Park Show	1,495	0	10			
Autumn Fruit Show	11	18	6			
Takings at Hall Shows	263	14	7			
				5,223	17	5
" JOURNALS AND OTHER PUBLICATIONS—						
Advertisements	875	1	7			
Sale of Publications	181	0	7			
				1,056	2	2
" HALL LETTINGS	2,240	14	0			
Less Labour Expenses	209	16	1			
				2,030	17	11
" PRIZES AND MEDALS				233	16	7
" EXAMINATIONS IN HORTICULTURE—						
Amount received in Fees	324	12	6			
Less expended	226	16	8			
				97	15	10
" INSPECTION OF GARDENS—						
Amount received in Fees	201	5	7			
Less expended	193	1	11			
				8	3	8
" WISLEY GARDENS—						
Produce sold	78	12	11			
Students' Fees	73	10	0			
				152	2	11
" EDUCATIONAL GRANT, WISLEY SCHOOLS—						
For the year ending 30th Sept., 1912	250	0	0			
" " 30th Sept., 1913	250	0	0			
				500	0	0
" LIFE COMPOSITIONS—						
Being amount paid by Fellows now deceased				68	5	0

Carried forward . £32,668 16 2

Dr.

ANNUAL REVENUE & EXPENDITURE ACCOUNT

		£	s.	d.	£	s.	d.
	<i>Brought forward</i>				21,414	8	2
To CONTRIBUTION to LINDLEY LIBRARY (Purchase of Books)		540	5	8			
„ CONTRIBUTION to LINDLEY LIBRARY		60	0	0			
					600	5	8
„ SPECIAL EXPENDITURE—							
Portrait. Rev. W. Wilks		367	10	0			
Donation to Masters' Memorial Fund		252	3	6			
„ Pritzel Revision Fund		250	0	0			
„ Lister Memorial		52	10	0			
„ Hooker		5	5	0			
Share in Collector's Expedition in China		100	0	0			
Orchid Register		50	0	0			
					1,077	8	6
„ DEPRECIATION—							
Hall Glass Roof, Furniture, Glass Houses,							
Wisley, Plant and Materials					637	15	5
					23,729	17	9
„ BALANCE, carried to BALANCE SHEET					8,938	18	5
					<u>£32,668</u>	<u>16</u>	<u>2</u>

FOR YEAR ENDING 31st DECEMBER, 1913—continued. Cr.

	£	s.	d.	£	s.	d.
Brought forward .				32,668	16	2

£32,668 16 2

BALANCE SHEET.

	£	s.	d.	£	s.	d.
TO CAPITAL FUNDS ACCOUNT—						
As at 31st December, 1912 .	£36,313	12	4			
Less Fees paid by Fellows now deceased .		68	5	0		
				36,245	7	4
Life Compositions received since .				411	12	0
						36,656 19 4
„ SUNDRY CREDITORS						565 9 7
„ SUBSCRIPTIONS, &c., paid in advance						680 18 0
„ WISLEY SCHOLARSHIPS—						
Balance 31st December, 1912	£6	5	0			
Given by the Society, 1913	25	0	0			
				31	5	0
Less paid to Scholars				31	5	0
„ RESERVE ACCOUNT—HALL PAINTING—						
Balance 31st December, 1912				223	13	4
Added 1913				150	0	0
						373 13 4
„ DEPRECIATION AND RENEWALS RESERVE ACCOUNT—						
As at 31st December, 1912				3,664	13	6
Added 1913				637	15	5
						4,302 8 11
„ WILLIAMS MEMORIAL FUND						8 0 5
„ MASTERS MEMORIAL FUND						12 1 5
„ SCHRÖDER PENSION						9 8 4
„ LINDLEY LIBRARY TRUST						13 18 5
„ PRITZEL REVISION FUND						109 2 2
„ GENERAL REVENUE ACCOUNT—						
Balance, 31st December, 1912	81,399	18	2			
Less Bad Debts				6	11	0
				81,393	7	2
„ REVENUE FOR THE YEAR, as per annexed Account				8,938	18	5
						90,332 5 7

£133,064 5 6

31st DECEMBER, 1913.

Cr.

		£	s.	d.	£	s.	d.
By CAPITAL EXPENDITURE—							
„ NEW HALL AND OFFICES—							
As at 31st December, 1912					40,950	11	2
„ FURNISHING HALL AND OFFICES—							
As at 31st December, 1912		2,332	9	2			
Expenditure since (Cabinets)		35	17	9			
					2,368	6	11
„ WISLEY GARDENS :—							
Dwelling Houses—							
As at 31st December, 1912		5,579	11	10			
Glass Houses, Ranges, Potting Shed, &c.—							
As at 31st December, 1912		£4,680	4	6			
Expenditure since		217	15	0			
					4,897	19	6
Laboratory—							
As at 31st December, 1912		1,627	14	11			
					12,105	6	3
N.B.—The Wisley Estates are, under the Trust Deed, vested in the Society only so long as it is in the position to use them as an Experimental Garden. The value of the expenditure thereon depends therefore on the continual use of the Garden by the Society.							
„ PLANT AND MATERIALS—							
Appliances for Shows		296	11	0			
Horses & Carts, Garden Plant, &c., Wisley		89	4	11			
Furniture and Fittings, Wisley		180	1	3			
Fencing and Wire Netting, Wisley		102	6	0			
Scientific Instruments and Fittings, Laboratory		205	6	5			
Breakable Apparatus, Laboratory		95	2	4			
					968	12	8
„ SUNDRY DEBTORS AND PAYMENTS MADE IN ADVANCE							
					1,847	11	8
„ INVESTMENT OF DEPRECIATION and RENEWAL and RESERVE ACCOUNT—							
3½% India Stock £3,831 0 2 cost					3,664	13	6
(The approximate value of this Investment on the 1st January, 1914, is £3,256 7s. 2d.)							
„ INVESTMENTS, as per Schedule							
(The approximate value of these Investments on the 1st January, 1914, is £61,826 18s. 2d.)							
					68,202	7	9
„ CASH—							
At Bank on Current and Deposit Accounts		2,914	0	3			
In Hand		42	15	4			
					2,956	15	7

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st Dec., 1913. £133,064 5 6

ALFRED C. HARPER, Auditor
(HARPER BROTHERS & FEATHER, Chartered Accountants),
16th January, 1914. 35 Great Tower Street, London, E.C.

DR.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes,

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1912 . . .	1,797	8	9			
„ Dividends Received, 1913				50	11	0

WILLIAMS

Raised by Donations in 1891 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1912 . . .	168	0	0			
„ Transfer from Income Account	36	2	5			
	204	2	5			
„ Balance 31st December, 1912				36	2	5
„ Dividends Received, 1913				8	0	5
				44	2	10

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1912 . . .	290	13	6			
„ Contribution from R. H. Society, 1913 . . .	252	3	6			
	542	17	0			
„ Balance 31st December, 1912				7	7	3
„ Dividends Received, 1913				14	14	2
				22	1	5

LAWRENCE

	£	s.	d.
To Amount of Fund, 31st December, 1912 . . .	127	0	5

NICHOLSON

Raised by Donations in 1908 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1912 . . .	33	12	6			
„ Transfer from Lawrence Testimonial Fund . . .	127	0	5			
	160	12	11			
„ Dividends received 1913				6	2	2

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1912 . . .	557	14	6			
„ Balance 31st December, 1912				9	8	4
„ Dividends received, 1913				20	0	0
				29	8	4

TRUST FUND.**Cr.**

or in any other way the Council may determine.

	£	s.	d.	£	s.	d.
By Consols, £2,022 8s. 9d. cost	1,797	8	9			
„ Revenue and Expenditure Account				50	11	0

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£	s.	d.	£	s.	d.
By East India Railway Annuity Class B £7	168	0	0			
„ New South Wales Government 4 per cent Inscribed Stock (1933) £36 3s. 1d.	36	2	5			
	204	2	5			
„ Transfer to Capital Account				36	2	5
„ Balance in hands of R. H. Society				8	0	5
				44	2	10

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£	s.	d.	£	s.	d.
By Midland Railway Consolidated 2½ per cent. Perpetual Preference Stock £800	542	17	0			
	542	17	0			
„ Prof. Biffen for Lectures, 1913				10	0	0
„ Balance in hands of R. H. Society				12	1	5
				22	1	5

TESTIMONIAL FUND.

	£	s.	d.
By Transfer to Nicholson Memorial Fund	127	0	5

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£	s.	d.	£	s.	d.
By Tasmanian Government 4 per cent. Inscribed Stock 1920-40, £162 4s. 5d	160	12	11			
	160	12	11			
„ Transfer to Wisley Prize Fund				6	2	2

PENSION.

Schróder to pay to Gardeners' Royal Benevolent Institution for one Pension.

	£	s.	d.	£	s.	d.
By Great Western Railway 4 per cent. Debenture Stock £500	557	14	6			
„ Gardeners' Royal Benevolent Institution				20	0	0
„ Balance in hands of R. H. Society				9	8	4
				29	8	4
				b	2	

Dr.

LINDLEY LIBRARY

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1912	5,121	15	4			
„ Contribution from R. H. Society, 31st December, 1913	510	5	8			

 5,632 1 0

To Balance, 31st December, 1912				7	7	11
„ Dividends and Donations Received to 31st December, 1913				46	10	6
„ Contribution from R. H. Society, 31st December, 1913				60	0	0
				<u>113</u>	<u>18</u>	<u>5</u>

PRITZEL REVISION

Fund to be raised for the Revision of Pritzel's Iconum-

	£	s.	d.	£	s.	d.
To Contribution from International Horticultural Exhibition	250	0	0			
„ Contribution from R. H. Society.	250	0	0			
	<u>500</u>	<u>0</u>	<u>0</u>			
„ Contribution from Veitch Memorial Trustees				100	0	0
„ Dividends received				9	2	2
				<u>109</u>	<u>2</u>	<u>2</u>

TRUST.

Cr.

	£	s.	d.	£	s.	d.
By Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock £1,458 15s. 7d. held by the Charity Commissioners . . .	1,516	0	0			
„ Value of Library, 31st December, 1912 . . .	3,005	15	4			
„ Purchase of Books, 1913 (<i>see</i> Report) . . .	540	5	8			
	5,662	1	0			
„ Librarian's Salary				100	0	0
„ Balance in hands of R. H. Society				13	18	5
				113	18	5

FUND.

Botanicarum Index. Estimated cost, £3,000.

	£	s.	d.	£	s.	d.
By India 2½ per cent. Stock, £773 12s. 6d.	500	0	0			
	500	0	0			
„ Balance in hands of R. H. Society				109	2	2
				109	2	2

SCHEDULE OF INVESTMENTS.

31st December, 1913.

		£	s.	d.
2½ % Consols £8,554 5s. 2d.	cost	8,162	16	0
3 % Local Loans £5,800	"	6,006	16	6
3½ % Indian Rupee Paper 37,000 Rupees	"	2,462	14	4
3½ % Dominion of Canada Registered Stock (1930-1950) £2,000	"	2,000	0	0
4 % Canadian Pacific Railway Co. Perpetual Consolidated Debenture Stock £4,632	"	4,999	14	1
3½ % London County Consolidated Stock £3,000	"	3,020	13	6
4 % Great Eastern Railway Debenture Stock £3,500	"	3,969	17	3
3½ % India Stock £2,063 4s. 6d.	"	2,024	10	4
4 % Northern Pacific and Great Northern Railway Joint Bonds (1921) £5,000	"	5,056	6	0
4 % New York Central and Hudson River Railroad Co. Thirty-Year Gold Debentures of 1904 £6,000	"	5,857	6	9
4 % Chicago, Milwaukee and St. Paul Railway Co. 25 years Gold Bonds of 1909 £2,000	"	1,930	4	0
4½ % Central Argentine Railway Consolidated Preference Stock £2,800	"	2,907	3	6
5 % Buenos Ayres Great Southern Railway Preference Stock £2,500	"	2,985	8	6
5 % Havana Terminal Railroad Company Mortgage Deben- ture Bonds £8,300	"	8,946	0	0
5 % State of San Paulo Treasury Bonds (1913) £5,000	"	4,897	13	0
5 % Leopoldina Terminal Company, Ltd, Debentures £2,000	"	1,975	4	0
4 % Mortgage on Freehold £1,000	"	1,000	0	0
		£68,202	7	9

GENERAL MEETING.

FEBRUARY 24, 1914.

Sir ALBERT K. ROLLIT, J.L.D., D.C.L., in the Chair.

Fellows elected (81).—Mrs. M. A. Adams, Mrs. W. V. Ball, Mrs. Bainton, H. Barnwell, J. Beams, H. Becker, Mrs. H. E. Beddington, Mrs. R. Beevor, W. S. Bird, Mrs. A. Brampton, P. Brears, C. A. Brown, Mrs. W. L. Buller, Mrs. H. M. Buncombe, Hon. Mildred Campbell, C. P. F. Castle, J. Cishegg, Mrs. G. Cope, R. S. Craig, G. Currey, Miss L. F. de Chaumont, Mrs. Dowding, Miss Dunlop, G. Elin, Mrs. Everett, H. Falkenburg, Mrs. Falkenburg, P. G. C. Foster, Miss E. Fox, L. Frere, Mrs. S. Furber, Miss E. H. Garnham, B.A., A. G. Garrad, F. G. Gibson, J.P., Mrs. W. Goff, J. T. Good, E. Goslin, J. S. Gowar, Mrs. A. Graham, Mrs. W. S. Harris, Mrs. Henderson, H. Hepner, R. Hicks, Mrs. Hibbert, R. G. Hovenden, Mrs. A. Ionides, Mrs. W. J. Jones, W. F. Keep, Capt. C. M. Knight, C. S. Langdale, Miss A. R. L. Learmonth, Mrs. A. Lowry, E. S. McEuen, R. K. Magor, S. Mavrojani, Miss Meiklejohn, W. Mullock, Lord O'Hagan, Miss Orrell, Mrs. H. L. Pattinson, Miss Peirse-Duncombe, Mrs. W. Poste, W. Robinson, F. A. Sansom, P. E. Sewell, J.P., H. Simon, Mrs. E. Sisterson, G. G. Stanham, Mrs. C. Steel, J. H. Stone, Mrs. F. Strickland, G. W. Taylor, Miss A. J. Thompson, Mrs. Treffry, A. F. Turner, Mrs. F. West, Mrs. H. Western, H. N. Wethered, J. Woolnough, Mrs. E. A. Wright, Miss H. Wrightson.

Associates (8).—Miss E. A. Alexander, Miss P. Ashwell, Miss A. Bird, Miss N. Drage, Miss M. Powell, Miss M. G. Holmes, Miss Longhurst, Miss Wallace.

Societies Affiliated (3).—Crownfield Hort. Soc.; Southampton Royal Hort. Soc.; Urmston Hort. Soc.

A lecture on "The Use of Explosives and of the Blow-lamp in the Garden" was given by Dr. H. E. Durham, Sc.D., M.B. (see p. 7).

GENERAL MEETING.

MARCH 10, 1914.

Mr. C. R. FIELDER, V.M.H., in the Chair.

Fellows elected (102).—Lady Aberdour, J. W. Arbuthnot, Mrs. C. E. Arkwright, R. Baelz, F. M. Baer, C. Bailey, A. E. Baker, R. R. Baker, Mrs. R. Barber, Mrs. H. C. Baynes, Col. D. A. Blest, Mrs. Brierley, W. Brown, Miss Bryan, H. Butler, H. Butt, P. Byfield, Lady Robert Cecil, Viscount Chelsea, A. M. Christie, Mrs. Clark, Mrs. H. Clouston, Mrs. Clowes, Miss F. Cook, Mrs. G. J. Cookson, Mrs. G. T. Crane, Miss E. Crossman, Mrs. Day, Mrs. R. S. E. Doll, T. Millie Dow, Major A. B. Drummond, H. T. F. Dumas, Mrs. H. T. F. Dumas, Mrs. Ellston, Miss A. Elwin, Miss A. A. England, J. W. Esplin, Mrs.

J. Ferguson, T. G. C. Fergusson, A. P. W. Forrest, Miss E. M. Gordon, Mrs. F. Gott, G. E. Gray, Mrs. Greame, Miss E. B. Grigsby, Mrs. Hadden, Mrs. G. C. Hamilton, E. Hayman, A. P. Henderson, Mrs. Heneage, J. J. Hogbin, Mrs. C. Hollins, W. Hopkins, Lee Hudson, Mrs. J. Humphery, W. H. Hutton, Mme. Inouyé, Dr. L. Jones, Mrs. S. H. Jones, Mrs. G. A. Keef, J. J. Kettle, Mrs. Leggatt, Mrs. Macnab, E. S. G. Malins, Miss M. Marchant, H. Masters, Major P. Maud, C.M.G., W. M. Maynard, Miss Meade, H. L. Mellersh, J. Merritt, F. W. Milln, W. H. Morgan, Mrs. C. Murray, A. M. Nicholls, Mrs. O'Connor, R. S. Owen, T. H. Pain, Mrs. F. Parish, E. Parnell, C. N. Peake, J. S. Pownall, Miss M. C. M. Ratcliff, Lord St. Audries, Lady Geraldine St. Lawrence, Lady Selfe, Hon. Mrs. Wilfrid Smith, Mrs. Guy O. Smith, W. G. Smith, Mrs. W. H. Squire, H. Taylor Taylor, Mrs. C. H. Trimmer, Mrs. T. Verrinder, Miss Von Heyder, Mrs. R. R. Wettenhall, Miss Wicks, Dr. J. Wigglesworth, Col. J. R. Wilmer, F.R.G.S., Miss C. W. Wilson, Mrs. Basil Wilson, G. E. B. Wrey, Miss C. B. Wylde.

Fellows resident abroad (2).—P. Valentine Kerr (Victoria, Australia), George Williams (Queensland).

Associates (3).—R. Daniels, H. Edwards, J. Dean Miles.

A lecture on "Adaptive Degradations: the Cause of many Cases of Evolution among Plants," was given by Professor G. Henslow, M.A., V.M.H. (see p. 19).

SPRING SHOW OF FORCED BULBS.

TUESDAY AND WEDNESDAY, MARCH 10 AND 11, 1914.

HYACINTHS, TULIPS, AND DAFFODILS.

The Council offered (subject to the General Rules of the Society) the following Prizes presented to them by the General Bulb Growers' Society of Haarlem :—

*Division I.—For Amateurs.**

Class 3.—Eighteen Hyacinths, distinct.

First Prize, £6 6s. ; Second, £5 5s. ; Third, £4 4s. ; Fourth, £3 3s. ; Fifth, £2 2s. ; Sixth, £1 1s.

1. Duke of Portland, K.G., Welbeck Abbey, Worksop (gr. J. Gibson).
2. Lord Hillingdon, Wildernesse, Sevenoaks (gr. J. Shelton).

* By the word Amateur is understood a person who maintains a Garden with a view to his own use and enjoyment, and not for the purpose of making a profit or gaining a livelihood. The fact of his disposing of surplus produce for money does not change him into a tradesman unless the maintenance of the Garden is intended to return him an annual profit.

By the word Nurseryman or Trade Grower is understood a person who maintains a Garden for the purpose of gaining a livelihood or intends it to return him an annual profit.

No person was permitted to exhibit both as an Amateur and as a Nurseryman or Trade Grower.

3. Col. the Right Hon. Mark Lockwood, C.V.O., Bishop's Hall, Romford (gr. G. Craddock).
4. T. Woodsend, Esq., Cleveley, Allerton, Liverpool (gr. H. Osborne).
5. Mrs. H. Balfour, Headington Hill, Oxford.
6. C. B. Gabriel, Esq., Easdale, Horsell, Woking.

Class 4.—Twelve Hyacinths, distinct.

First Prize, £5 5s. ; Second, £4 4s. ; Third, £3 3s. ; Fourth, £2 2s. ; Fifth, £1 1s.

1. Marquis of Salisbury, Hatfield House, Herts (gr. H. Prime).
2. R. G. Morrison, Esq., Victoria Park, Wavertree.
3. Mrs. McDowell Nathan, Little Heath, Potters Bar (gr. W. Newton).
4. Marquis of Ripon, Coombe Court, Kingston Hill (gr. T. Smith).
5. Miss C. A. Michell, Oakfield, Cricklewood, N.W.

Class 5.—Six Hyacinths, distinct.

First Prize, £2 2s. ; Second, £1 10s. ; Third, £1 1s. ; Fourth, 10s.

1. Mr. A. Levita, Norton Priory, Chichester (gr. H. Edwards).
2. L. Thomson, Esq., Ailsa Craig, Formby, Liverpool.
3. Lady Tate, Park Hill, Streatham Common (gr. W. Howe).

Class 6.—Four pans containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other three pans. The bulbs need not have been actually grown in the pans they were shown in.

First Prize, £4 4s. ; Second, £3 3s. ; Third, £2 2s. ; Fourth, £1 1s.

1. { Marquis of Salisbury.
Duke of Portland, K.G.
 2. Col. the Right Hon. Mark Lockwood, C.V.O.
- No other entries.

Class 7.—The finest decorative display of Hyacinths grown from first size bulbs.

Prize—The Gold Medal of the General Bulb Growers' Society of Haarlem.

Duke of Portland, K.G.

Division II.—For Trade Growers.

Class 8.—The finest decorative display of Hyacinths grown from first size bulbs.

Prize—The Gold Medal of the General Bulb Growers' Society of Haarlem.

Messrs. Cuthbert, Southgate Nurseries, N.

Subject to the General Rules of the Society the Council offered

the following Prizes presented to them by Messrs. Robert Sydenham, Ltd. :—

Classes 9-11.—Bulbs grown in moss fibre or similar material (not earth) and without drainage.

Amateurs.

Class 9.—Six single Hyacinths, in separate vases, not exceeding six inches in diameter, to be selected from any one of the following varieties: 'Boerhaave,' 'City of Haarlem,' 'Enchantress,' 'General Vetter,' 'Innocence,' 'Ivanhoe,' 'Jacques,' 'King of the Blues,' 'Koh-i-Noor,' 'Lady Derby,' 'La Grandesse,' 'Queen Mary,' 'Schotel,' 'Totula,' 'Victory.'

First Prize, £1 1s.; Second, 17s. 6d.; Third, 15s.; Fourth, 10s. 6d.; Fifth, 7s. 6d.

1. Lady Tate.
2. Miss C. A. Michell.
3. Miss E. M. Rawlins, Great Houghton Hall, Northants.
4. Hon. Mrs. Guy Baring, Biddesden House, Andover.
5. Miss G. Thompson, The Elms, Potters Bar.

Class 10.—Six vases of Tulips (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Couleur Cardinal,' 'Fabiola,' 'Golden Queen,' 'Joost van Vondel,' 'Keizerskroon,' 'Le Rêve,' 'Pink Beauty,' 'Prince of Austria,' 'Red Admiral,' 'Rose Luisante,' 'Van der Neer,' 'Vermilion Brilliant,' and 'White Joost van Vondel.'

First Prize, £1 1s.; Second, 17s. 6d.; Third, 15s.; Fourth, 10s. 6d.; Fifth, 7s. 6d.

1. Lady Tate.
 2. Hon. Mrs. Guy Baring.
 3. Miss G. Thompson.
- No other entries.

Class 11.—Six vases of Narcissi (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Albatross,' 'Argent,' 'Artemis,' 'Cardinal,' 'Cresset,' 'Dairymaid,' 'Diadem,' 'Duchess of Westminster,' 'Firebrand,' 'Glitter,' 'Gloria Mundi,' 'Golden Bell,' 'Golden Nugget,' 'Horace,' 'Lilian,' 'Lucifer,' 'Madame de Graaff,' 'Mrs. C. Bowley,' 'Scarlet Runner,' 'Seagull,' 'Siddington,' 'Stonechat,' 'Victoria,' and 'White Lady.'

First Prize, £1 1s.; Second, 17s. 6d.; Third, 15s.; Fourth, 10s. 6d.; Fifth, 7s. 6d.

1. Lady Tate.
 2. Hon. Mrs. Guy Baring.
 3. Miss E. M. Rawlins.
- No other entries.

GENERAL MEETING.

MARCH 24, 1914.

Prof. FREDERICK KEEBLE, F.R.S., Sc.D., in the Chair.

Fellows elected (94).—Mrs. Abbey, E. G. Appleby, R. Vander Beken, H. E. Box, J. R. Box, Mrs. C. W. Bracher, Mrs. Cecil Brown, H. Taylor Browne, H. Bushell, R. O. Campbell, Miss Cartland, F. R. Clarke, J. Clemmett, Mrs. A. Coats, Mrs. L. Crawshay-Williams, C. Dale, Mrs. J. H. C. Dalton, Miss J. C. Dobson, J. Dobson, Mrs. G. W. Duncan, J. A. Duthie, A. W. Elliott, Miss M. C. Fidler, W. Franks, Miss C. Freshfield, Mrs. Geoghegan, Mrs. C. J. M. Gordon, Mrs. Heriot, Miss Higgon, Harry Ide, Mrs. P. Illingworth, Mrs. W. F. Jackson, R. B. Lambrick, J. Lawson, Mrs. R. V. Le Bas, A. Lechmere, Mrs. Le Marchant, Mrs. A. Levita, W. Lillico, W. Low, A. Luker, Miss E. McCalmont, Mrs. J. S. McComb, Mrs. R. McKay, J. McNaught, Mrs. Macrae, L. Makower, Mrs. Manning, H. H. Mason, Sir H. Miller, Mrs. H. Morris, Mrs. H. W. Murray, J. J. Myers, A. Neame, E. G. Nisbet, W. W. Palmer, Major H. W. M. Parker, Mrs. E. G. Pemberton, Mrs. E. C. Philp, E. P. Polden, F. Preston, Lady Rycroft, Mrs. P. A. Ransom, Miss Ravenhill, W. B. Reeve, E. C. Richardson, A. Richmond, W. H. Romaine-Walker, Mrs. Ian Ross, Mrs. J. A. Rudd, Sir Stuart Samuel, Bart., M.P., Miss Sands, Mrs. A. M. Sewell, G. Shorter, E. Stainton, C. Stanford, A. J. Stevens, G. Stuart, Mrs. Crichton Stuart, Mrs. H. M. Swanwick, M.A., F. C. Taylor, Lady Adelaide Taylour, Mrs. Thackwell, W. E. Trevithick, Mrs. W. F. Tuke, Mrs. J. C. Uhthoff, Dr. Wynne Walker, Miss A. Warner, Mrs. I. C. Webb, Mrs. G. Wemyss, H. E. Whaley, Mrs. J. W. Wildy, C. Wiles, Mrs. H. G. H. Wilkinson.

Fellows resident abroad (2).—S. K. Ahmed (India), Dr. Campbell (Mentone).

A lecture on "The Pruning of Shrubs" was given by Mr. Edwin Beckett, V.M.H. (see p. 24).

GENERAL MEETING.

APRIL 7, 1914.

Prof. F. KEEBLE, F.R.S., Sc.D., in the Chair.

Fellows elected (57).—Mrs. G. B. Adamson, Mrs. G. E. Ashdown, W. H. Bates, W. M. Blackwood, Lord Bolton, Lady Brocklehurst, C. Campbell, D. Campbell, Mrs. Clark, Mrs. A. W. Cleghorn, Mrs. L. Coghlan, Miss A. Danby, Mrs. R. A. Dawbarn, V. L. Debenham, Lady Dixon, Mrs. H. G. Fass, Miss J. Grace, Mrs. Graham, Mrs. H. H. Hancock, M. R. Hearn, W. J. Heriot, Mrs. G. M. Hildyard, C. G. Hill, Mrs. S. Holland, Mrs. F. E. Hookham, Mrs. Hopkins, Miss M. Hornby, Mrs. F. N. Jennings, C. G. P. Laidlaw, M.A., Miss E. Laing, E. J. Lloyd, H. McLeish, Mrs. E. A. Maunsell, Lady Mellor, H. W. Monckton,

xxviii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

H. Nash, J. C. Newsham, F.L.S., Miss V. Parry Okeden, Mrs. R. Paley, G. Parker, Mrs. H. Porter, Miss E. H. Pott, Miss M. B. Rhodes, H. Rollinson, Mrs. J. B. Rose, E. W. Rushworth, R. F. Sale, H. C. Slingsby, L. H. Sterne, Mrs. G. R. Stilwell, Capt. A. Stirling, D.L., H. Tarry, Mrs. W. Thom, Mrs. H. Walton, Mrs. Grant Wilson, W. H. Wood, Mrs. M. H. Wright.

Fellows resident abroad (4).—P. van Deursen (Holland), Miss S. M. Hawes (U.S.A.), Mrs. C. F. Hoffman (U.S.A.), J. G. Speller (B.C.).

Associates (3).—J. G. Bacon, Miss F. de H. Bevington, Miss F. V. Heron.

Societies affiliated (2).—Hayling Island Horticultural Society, International Garden Club.

A lecture on "The Cultivation of *Amaryllis* (*Hippeastrums*)" was given by Mr. C. R. Fielder, V.M.H. (see p. 35).

GENERAL MEETING.

APRIL 15, 1914.

Sir ALBERT ROLLIT, LL.D., D.C.L., in the Chair.

Fellows elected (34).—Mrs. W. Boosey, Capt. A. Campbell, Mrs. Collier, Dr. Connor, Rev. W. H. S. Davies, Major C. T. Dupont, D. M. Francis, Dr. Galpin, H. Gresham, Mrs. R. H. Harris, W. Pellew Harvey, Miss A. Hughes, Mrs. Devonshire Jones, R. B. Lemon, A. R. Lewis, M.A., D. H. Mackintosh, Mrs. J. McNamara, Emily Lady Mainwaring, F. Mathewson, Miss E. Mundy, Mrs. H. Nash, G. Niven, Mrs. D. E. Norton, A. G. Palmer, P. Ralli, Lady Savory, Miss F. B. Strofton, H. G. N. Stucley, G. G. Taylor, P. C. Tennant, Mrs. T. E. Watson, J. W. Wharram, Mrs. A. Wood, Mrs. Yarrow.

Fellows resident abroad (2).—H. Bader (Holland), W. de Ruyter (Holland).

Associate (1).—G. H. Cross.

A lecture on "The History and Function of Botanic Gardens" was given by Mr. Arthur W. Hill, M.A., F.L.S.

DAFFODIL SHOW.

WEDNESDAY AND THURSDAY, APRIL 15 AND 16, 1914.

ENGLEHEART CHALLENGE CUP.

[In view of the greatly increased interest taken in Daffodils, the President and Council of the Society have established the Engleheart Challenge Cup.

It is a Thirty Guinea Silver Cup, to be held for one year, subject to a sufficient insurance against loss and a guarantee to return it in good condition, or, failing this, to refund the sum of £35 to the Society; but it may be won by the same grower in consecutive years. A

smaller Commemorative Cup will be given to the winner when the Challenge Cup, having been restored to the Society, passes to a different grower.

The decision of the Council is final, and the Cup may be altogether withheld at their discretion.

In 1914 it was offered in Class 33 for 12 Seedlings, distinct, which have not yet been put into commerce.]

P. D. Williams, Esq., St. Keverne, Cornwall.

THE BARR CHALLENGE CUP.

W. B. Cranfield, Esq., East Lodge, Enfield Chase (gr. F. Start).

SECTION I.

Open Classes.

(Exhibitors in Section I. may not enter or compete in Sections II. and III.)

Class 1.—Collection of Daffodils, 48 varieties, distinct, fairly representing the different Divisions. Three stems of each.

First Prize, Gold Medal; Second, Silver-gilt Flora Medal and £1; Third, Silver Flora Medal and £1.

1. A. M. Wilson, Esq., Shovell, North Petherton, Somerset.
2. C. Bourne, Esq., Simpson, Bletchley.
3. F. H. Chapman, Esq., Rye, Sussex.

Class 2.—Twelve Long Trumpet Daffodils, distinct varieties. (Division I.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. C. Bourne, Esq., Simpson, Bletchley.
2. Messrs. Cartwright & Goodwin, Kidderminster.
3. W. A. Watts, Esq., Bronwyflla, St. Asaph.

Class 3.—Twelve *Incomparabilis* Daffodils, distinct varieties. (Division II.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. Messrs. Cartwright & Goodwin.
2. C. Bourne, Esq.
3. W. A. Watts, Esq.

Class 4.—Twelve *Barrii* Daffodils, distinct varieties. (Division III.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. C. Bourne, Esq.
2. F. H. Chapman, Esq.
- No other award.

Class 5.—Nine *Leedsii* Daffodils, distinct varieties. (Division IV.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, £1; Third, 10s.

1. Messrs. Cartwright & Goodwin.

2. W. A. Watts, Esq.

3. C. Bourne, Esq.

Class 6.—Nine Daffodils, distinct varieties, selected from Divisions V., VI., and VII. Three stems of each.

First Prize, £1 ; Second, 15s. ; Third, 10s.

1. Messrs. Cartwright & Goodwin.

No other awards.

Class 7.—Nine Polyanthus (Tazetta) Daffodils, including Poetaz varieties ; distinct. (Division VIII.) Three stems of each.

First Prize, £1 ; Second, 15s. ; Third, 10s.

1. No first.

2. Messrs. Cartwright & Goodwin.

No other entries.

Class 8.—Six Poeticus Daffodils, distinct varieties. (Division IX.) Three stems of each.

First Prize, Silver-gilt Banksian Medal and £1 ; Second, £1 ; Third, 10s.

1. F. H. Chapman, Esq.

2. C. Bourne, Esq.

3. W. A. Watts, Esq.

Class 9.—Six Double Daffodils, distinct varieties. (Division X.) Three stems of each.

First Prize, 10s. ; Second, 7s. 6d. ; Third, 5s.

1. Messrs. Cartwright & Goodwin.

No other awards.

SECTION II.

*Amateurs only.**

All flowers in this Section must be in commerce.

Class 10.—Collection of Daffodils, 24 varieties, distinct, fairly representing the different Divisions. Three stems of each.

First Prize, Silver Cup and £1 ; Second, Silver-gilt Flora Medal and 15s. ; Third, Silver Banksian Medal and 10s.

1. N. G. Lower, Esq., Presteign, Radnor.

2. Rev. T. Buncombe, Black Torrington, Devon.

No other entries.

Class 11.—Six Long Trumpet Daffodils, distinct varieties. (Division I.) Three stems of each.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

1. Rev. T. Buncombe.

2. H. R. Darlington, Esq., F.L.S., Park House, Potters Bar.

No other entries.

* See footnote, p. xxiv.

Class 12.—Six *Incomparabilis* Daffodils, distinct varieties. (Division II.) Three stems of each.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

1. Rev. T. Buncombe.

2. H. R. Darlington, Esq., F.L.S.

No other entries.

Class 13.—Six *Barrii* Daffodils, distinct varieties. (Division III.) Three stems of each.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

1. H. R. Darlington, Esq., F.L.S.

2. Rev. T. Buncombe.

No other entries.

Class 14.—Six *Leedsii* Daffodils, distinct varieties. (Division IV.) Three stems of each.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

1. Duke of Rutland, Belvoir Castle (gr. W. H. Divers).

2. Rev. T. Buncombe.

3. H. R. Darlington, Esq., F.L.S.

Class 15.—Six *Poeticus* Daffodils, distinct varieties. (Division IX.) Three stems of each.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

1. Rev. T. Buncombe.

2. H. R. Darlington, Esq., F.L.S.

No other entries.

Class 16.—Six Hybrid *Triandrus* Daffodils, distinct varieties. (Division V.) One stem of each.

First Prize, 15s. ; Second, 10s. ; Third, 7s. 6d.

1. H. R. Darlington, Esq., F.L.S.

No other entries.

Class 17.—Six *Polyanthus* (Tazetta) Daffodils, including *Poetaz* varieties, distinct. (Division VIII.) Three stems of each.

First Prize, 10s. ; Second, 7s. 6d. ; Third, 5s.

1. H. R. Darlington, Esq., F.L.S.

No other entries.

Class 18.—Three Double Daffodils, distinct varieties. (Division X.) Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. H. R. Darlington, Esq., F.L.S.

2. Duke of Rutland, Belvoir Castle (gr. W. H. Divers).

No other entries.

SECTION III.

Amateurs only.

All flowers in this Section must be in commerce.

(Exhibitors in Section III. were not permitted to enter or compete in Sections I. and II.)

Class 19.—Twelve Daffodils, distinct varieties, fairly representing the different Divisions. Three stems of each.

First Prize, Silver-gilt Banksian Medal and 10s. 6d. ; Second, Silver Flora Medal and 7s. 6d. ; Third, Silver Banksian Medal and 5s.

1. L. Studholme, Esq., Ballyegan, Birr, Ireland.
2. W. F. Mitchell, Esq., Leek Wootton, Warwick.
3. Rev. Canon Fowler, Earley Vicarage, Reading.

Class 20.—Three Trumpet Daffodils, distinct varieties. (Division Ia.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. No first.
2. W. B. Cranfield, Esq.
3. W. F. Mitchell, Esq.

Class 21.—Three Trumpet Daffodils, distinct varieties. (Division Ib.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. W. B. Cranfield, Esq.
 2. Miss Warren, Westbere, Canterbury.
- No other awards.

Class 22.—Three Trumpet Daffodils, distinct varieties. (Division Ic.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. R. Morton, Esq., Grange Dene, Woodside Park, N.
2. W. B. Cranfield, Esq.
3. Rev. Canon Fowler.

Class 23.—Three Incomparabilis Daffodils, distinct varieties. (Division IIa.) Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. W. B. Cranfield, Esq. (gr. F. Start).
2. William Smith, The Links, Bishop's Stortford.
3. Rev. Canon Fowler.

Class 24.—Three Incomparabilis Daffodils, distinct varieties. (Division IIb.) Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. R. Morton, Esq., Grange Dene, Woodside Park, N.
2. George Stocks, Esq., Bentley Road, Doncaster.
3. W. B. Cranfield, Esq.

Class 25.—Three *Barrii* Daffodils, distinct varieties. (Division IIIa.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

No entries.

Class 26.—Three *Barrii* Daffodils, distinct varieties. (Division IIIb.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. R. Morton, Esq.
2. W. F. Mitchell, Esq.
3. W. B. Cranfield, Esq.

Class 27.—Three *Leedsii* Daffodils, distinct varieties. (Division IV.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. W. F. Mitchell, Esq.
2. W. B. Cranfield, Esq.
3. R. Morton, Esq.

Class 28.—Three Hybrid *Triandrus* Daffodils, distinct. (Division V.)
One stem of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

No entries.

Class 29.—Three *Polyanthus* (*Tazetta*) Daffodils, including *Poetaz* varieties ; distinct. (Division VIII.) Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. Miss Warren.
 2. George Stocks, Esq.
- No other award.

Class 30.—Three *Poeticus* Daffodils, distinct varieties. (Division IX.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. George Churcher, Esq., Woodcote, Alverstoke.
2. George Stocks, Esq.
3. John W. Jones, Esq., Invermore, Woking.

Class 31.—Three Double Daffodils, distinct varieties. (Division X.)
Three stems of each.

First Prize, 7s. 6d. ; Second, 5s. ; Third, 3s.

1. W. F. Mitchell, Esq.
2. Miss Warren.
3. W. B. Cranfield, Esq.

SECTION IV.

Seedling and New Daffodils—Open Classes.

Class 32.—Twelve Daffodils, distinct varieties, not in commerce, or introduced into commerce during or since 1910. One stem of each.

First Prize, The R.H.S. Standard Silver Cup and £1; Second, Silver-gilt Flora Medal and 15s.; Third, Silver Flora Medal and 10s.

1. C. Bourne, Esq.
2. W. A. Watts, Esq.
3. Duke of Rutland.

Class 33.—Twelve Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, R.H.S. Engleheart Cup and £1; Second, Silver-gilt Flora Medal and £1; Third, Silver Flora Medal and 15s.

1. P. D. Williams, Esq.
2. W. Welchman, Esq., Upwell, Wisbech.
3. F. Herbert Chapman, Esq.

Class 34.—Six Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, Silver Flora Medal and 15s.; Third, Silver Banksian Medal and 10s.

1. A. M. Wilson, Esq.
2. H. Gore Hawker, Esq., Strode, Ermington, S. Devon.
3. W. A. Watts, Esq.

Class 35.—Three Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, Silver Flora Medal and 10s.; Second, Silver Banksian Medal and 7s. 6d.; Third, 7s. 6d.

1. N. G. Lower, Esq.
2. Messrs. Cartwright & Goodwin.
3. Rev. T. Buncombe.

Class 36.—Twelve Hybrid Triandrus Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, Silver-gilt Flora Medal and £1; Second, Silver Flora Medal and 15s.; Third, Silver Banksian Medal and 10s. 6d.

1. W. A. Watts, Esq.
 2. F. Herbert Chapman, Esq.
- No other entries.

Class 37.—Six Hybrid Triandrus Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, £1; Second, 15s.; Third, 10s.

1. W. F. M. Copeland, Esq.
- No other entries.

Class 38.—Twelve Seedling Daffodils, distinct, not in commerce, raised by the exhibitor. One stem of each.

First Prize, R.H.S. Silver-gilt Cup ; Second, R.H.S. Standard Cup ; Third, Silver-gilt Flora Medal.

1. A. M. Wilson, Esq.
2. W. Welchman, Esq.
3. W. F. M. Copeland, Esq.

Class 39.—Six Seedling Daffodils, distinct, not in commerce, raised by the exhibitor. One stem of each.

First Prize, R.H.S. Standard Cup ; Second, Silver-gilt Flora Medal ; Third, Silver-gilt Banksian Medal ; Fourth, Silver Banksian Medal.

1. P. D. Williams, Esq.
2. F. H. Chapman, Esq.
3. W. A. Watts, Esq.
4. Duke of Rutland.

Class 40.—Three Seedling Daffodils, distinct, not in commerce raised by the exhibitor. One stem of each.

First Prize, Silver-gilt Flora Medal ; Second, Silver Flora Medal ; Third, Silver Banksian Medal ; Fourth, Bronze Banksian Medal.

1. N. G. Lower, Esq.
2. Thomas Batson, Esq., Beaworthy, Devon.
3. C. Lemesle Adams, Esq., Pendeford Hall, Wolverhampton.
4. H. Gore Hawker, Esq.

SECTION V.

Single Blooms—Open Classes.

Class 41.—One Trumpet Daffodil. (Division Ia.) One stem.

First Prize, 10s. 6d. ; Second, 7s. 6d. ; Third, 5s.

1. P. D. Williams, Esq.
2. W. A. Watts, Esq.
3. H. Gore Hawker, Esq.

Class 42.—One Trumpet Daffodil. (Division Ib.) One stem.

First Prize, 10s. 6d. ; Second, 7s. 6d. ; Third, 5s.

1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. Messrs. Cartwright & Goodwin.

Class 43.—One Trumpet Daffodil. (Division Ic.) One stem.

First Prize, 10s. 6d. ; Second, 7s. 6d. ; Third, 5s.

1. Messrs. Cartwright & Goodwin.
2. H. Gore Hawker, Esq.
3. P. D. Williams, Esq.

Class 44.—One *Incomparabilis* Daffodil. (Division IIa.) One stem.

First Prize, 10s. 6*d.* ; Second, 7s. 6*d.* ; Third, 5s.

1. W. B. Cranfield, Esq.
2. P. D. Williams, Esq.
3. A. M. Wilson, Esq.

Class 45.—One *Incomparabilis* Daffodil. (Division IIb.) One stem.

First Prize, 10s. 6*d.* ; Second, 7s. 6*d.* ; Third, 5s.

1. W. A. Watts, Esq.
2. A. M. Wilson, Esq.
3. C. Bourne, Esq.

Class 46.—One *Barrii* Daffodil. (Division IIIa.) One stem.

First Prize, 10s. 6*d.* ; Second, 7s. 6*d.* ; Third, 5s.

1. A. M. Wilson, Esq.
2. C. Lemesle Adams, Esq., Pendeford Hall, Wolverhampton.
3. Messrs. Cartwright & Goodwin.

Class 47.—One *Barrii* Daffodil. (Division IIIb.) One stem.

First Prize, 10s. 6*d.* ; Second, 7s. 6*d.* ; Third, 5s.

1. A. M. Wilson, Esq.
2. P. D. Williams, Esq.
3. C. Bourne, Esq.

Class 48.—One *Leedsii* Daffodil. (Division IV.) One stem.

First Prize, 10s. 6*d.* ; Second, 7s. 6*d.* ; Third, 5s.

1. Messrs. Cartwright & Goodwin.
2. A. M. Wilson, Esq.
3. P. D. Williams, Esq.

Class 49.—One Hybrid *Triandrus* Daffodil. (Division V.) Trumpet-shaped. One stem.

First Prize, 10s. 6*d.* ; Second, 7s. 6*d.* ; Third, 5s.

1. W. B. Cranfield, Esq.
2. W. A. Watts, Esq.
3. Messrs. Cartwright & Goodwin.

Class 50.—One Hybrid *Triandrus* Daffodil. (Division V.) Short-cupped. One stem.

First Prize, 10s. 6*d.* ; Second, 7s. 6*d.* ; Third, 5s.

1. P. D. Williams, Esq.
2. C. Bourne, Esq.
3. Messrs. Cartwright & Goodwin.

Class 51.—One Hybrid Jonquilla Daffodil. (Division VII.) One stem.

First Prize, 10s. 6d. ; Second, 7s. 6d. ; Third, 5s.

1. P. D. Williams, Esq.
2. A. M. Wilson, Esq.
3. C. Bourne, Esq.

Class 52.—One Poetaz Daffodil. (Division VIII.) One stem.

First Prize, 10s. 6d. ; Second, 7s. 6d. ; Third, 5s.

1. A. M. Wilson, Esq.
2. Messrs. Cartwright & Goodwin.
3. W. A. Watts, Esq.

Class 53.—One Poeticus Daffodil. (Division IX.) One stem.

First Prize, 10s. 6d. ; Second, 7s. 6d. ; Third, 5s.

1. A. M. Wilson, Esq.
2. F. Herbert Chapman, Esq.
3. P. D. Williams, Esq.

Class 54.—One Double Daffodil. (Division X.) One stem.

First Prize, 10s. 6d. ; Second, 7s. 6d. ; Third, 5s.

1. W. A. Watts, Esq.
2. Messrs. Cartwright & Goodwin.
- No third.

SECTION VI.

Open to all Amateurs.

Irrespective of whether they were, or were not, competing in any of the previous sections.

Class 55.—A Collection of Daffodils :—consisting of three stems each of thirty-six distinct varieties fairly representing Divisions I., II., III., IV., V., IX., and X. (see " Classification of Daffodils, 1913 "). Divisions VI. and VII. optional, Divisions VIII. and XI. excluded.

The Council have accepted the prizes offered in this class by Messrs. Barr & Sons, for award at the Daffodil Show.

First Prize, the Barr Silver Daffodil Vase ; Second, £3 ; Third, £2.

1. W. B. Cranfield, Esq.
2. Rev. T. Buncombe.
3. Duke of Rutland.

GENERAL MEETING.

APRIL 21, 1914.

Mr. JOSEPH CHEAL in the Chair.

Fellows elected (44).—Baron Annaly, Mrs. B. Anthony, Major E. Barnes, Mrs. T. W. M. Bennett, Mrs. Rochfort Blakiston, W. R. Boelter, Mrs. Dymond, B. G. Gardner, Mrs. S. G. Gare, S. G. Gare,

G. G. Gatliff, Guy M. Gibbs, Mrs. H. Gray, Miss E. Grenside, Miss C. M. Griffiths, Rev. R. A. Hamilton, T. G. W. Henslow, A. H. Hobdell, Lady Hodgson, Mrs. Holle, J. W. Huxley, G. R. Jebb, H. S. Judd, Flora Klickmann, Mrs. Kohnstamm, T. J. Lacy, Mrs. J. Liddell, Mrs. J. Loxdale, F. W. V. Mitchell, Miss E. M. Moore, Mrs. Oakes, Alfred Pope, F.S.A., Mrs. H. Reynolds, Mrs. Rodman, Mrs. L. Stradling, Mrs. A. L. Sturge, Mrs. Swinburne, C. Ormonde Trew, J. C. Umney, F. A. H. Walsh, Mrs. E. Ward, J. G. Wardrop, Lady Williams, John Williams.

Fellows resident abroad (3).—Mrs. Lynden-Bell (Guernsey), Samuel Smith (Lahore, India), G. V. Van Zanten (Holland).

Associates (4).—G. W. Earp, L. H. Gadsden, Miss L. R. Hill, A. Willis.

Societies affiliated (2).—Royston Horticultural Society, Warwick (Queensland) Horticultural Society.

It was proposed by Mr. W. A. BILNEY, seconded by Mr. E. J. ANDERSON, and carried that :—

“ Forasmuch as Mr. C. E. West has neglected to pay his annual subscription as a Fellow for the space of six calendar months, the Fellows assembled in General Meeting this day (April 21, 1914) hereby declare Mr. C. E. West to have forfeited his rights and privileges as a Fellow of the Royal Horticultural Society, and as a consequence of this resolution under By-law 24 he ceases from this day forward to be a Fellow of the said Society.”

A lecture on “ The probable Origin of existing Flowering Plants ” was given by the Rev. Prof. G. Henslow, M.A., V.M.H. (see p. 40).

SCIENTIFIC COMMITTEE.

JANUARY 13, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Hybrid Scented Pelargoniums.—Mr. J. Fraser, F.L.S., continued his remarks regarding the origin of garden forms of scented-leaved Pelargoniums, dealing with the group to which *Pelargonium apiifolium* belongs, and exhibiting specimens from the Wisley collection in illustration of his remarks.

Polypodium × *Schneideri*.—Mr. W. Hales showed a fruiting frond of this hybrid Fern, with three pinnæ (very like those of *Polypodium aureum* in form) bearing numerous sori. This hybrid is derived from *P. aureum* × *P. vulgare elegantissimum*; and its spores, which are only very rarely produced, have hitherto proved infertile.

Variation in Galanthus Elwesii.—Mr. Bowles exhibited several plants of *Galanthus Elwesii* in flower, selected from those shown at this day's exhibition by Messrs. Barr and Sons and Mr. G. Reuthe, and grown from imported bulbs. They showed remarkable variation in form of flower, and especially in the markings of both inner and outer perianth pieces.

Aristolochia sempervivens fruiting.—Mr. Bowles also exhibited a fruit with ripe seeds of this plant from his garden at Waltham Cross.

SCIENTIFIC COMMITTEE, JANUARY 27, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Publication of Proceedings of Scientific Committee.—Mr. W. C. Worsdell, F.L.S., raised the matter of the publication of the minutes of the Scientific Committee in a collected form, so that they could be more readily consulted. Many matters of great interest and value are brought before the Committee from time to time, and from the fact that the minutes were published along with so much other matter in the JOURNAL, Mr. Worsdell feared that they were frequently lost sight of. Mr. Chittenden said that a complete index of the contents of the last series of the Society's JOURNAL was being made, and that would at least in part remove the difficulty that certainly existed when it became necessary to consult so large a bulk as the long series of the Society's JOURNAL made.

Hybrid Pelargoniums.—Mr. J. Fraser, F.L.S., continued his remarks upon the origin of the scented-leaved Pelargoniums, dealing with plants of several sections, including *Pelargonium tetragonum*, *P. echinatum*, and others. He illustrated his remarks by reference to

specimens from the Wisley collection, and they will be included in full in the report on these plants upon which he is engaged.

Fertility of Soil under Ricks, &c.—Mr. Downer drew attention to the greater degree of fertility shown by soil which has been covered by a rick, and also by the spots on which shocks of wheat have stood in wet seasons. The Committee considered that the fact that rain washed out a considerable amount of the earth salts which plants contained, especially after they were dead, accounted in part for this extra fertility, and in some cases the washing of the soil to which uncovered parts are exposed may account in part for the lowered fertility of these, while the surfaces covered with ricks &c., while protected from drying, are also protected from the serious washing which occurs when heavy rains fall. A great amount of refuse finds its way into the soil when ricks are removed and the earth turned up, and this also may have the effect of increasing its fertility.

SCIENTIFIC COMMITTEE, FEBRUARY 10, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and fourteen members present.

Hybrid Pelargoniums.—Mr. Fraser, F.L.S., continued his remarks upon the origin of scented Pelargoniums, and illustrated them by specimens from the Wisley collection. He dealt principally with *Pelargonium zonale*, *P. inquinans*, *P. betulinum*, and *P. cucullatum*.

Odontoglossum sp.—Mr. R. A. Rolfe, A.L.S., exhibited on behalf of Mr. H. S. Goodson, of Fairlawn, Putney, a rare species of *Odontoglossum* from Peru. Mr. Rolfe took a specimen to examine and report upon it (see p. xli).

Odontonia × '*Lucilia*.'—A plant of this new hybrid was submitted to the Committee from the Orchid Committee. It was raised from seed of *Odontoglossum cirrhosum* fertilized by pollen of *Miltonia spectabilis* Moreliana. It has apparently proved difficult to raise a cross the other way, and the result has given a remarkable purple flower. A Certificate of Appreciation was unanimously recommended to Messrs. Charlesworth, the raisers.

With reference to this hybrid Mr. Gurney Wilson, F.L.S., writes as follows: "This remarkable hybrid is the result of crossing *Odontoglossum cirrhosum* ♀ with *Miltonia spectabilis* var. *Moreliana*. For many years hybridists have attempted to utilize the rich purple colour of the latter parent, and, although hundreds of failures have occurred, success has at last been obtained by Messrs. Charlesworth & Co., Haywards Heath. The flower spike has taken the very unusual period of nearly twelve months to develop, and after reaching a height of 30 inches remained dormant for some time, but eventually produced three flowers at its extreme apex. Three or four narrow leaves were produced at intervals on the spike, which suggests that it was of somewhat vegetative habit. No doubt the spike was abnormal, and

future events which will show its real characters are awaited with interest."

Fusarium bulbigenum.—Mr. C. E. Shea referred to this parasite of *Narcissus* and other bulbs, and the Secretary recounted its history in England. It was described some years ago by Messrs. Cooke and Massee, and was apparently lost sight of for about twenty years until in the hot summer of 1911 specimens were shown before this Committee, and in that year the fungus proved troublesome also in Holland. There are grounds for supposing that rather high temperatures are necessary for the development of this fungus, and that therefore it is likely that the disease will be evident only in certain seasons, at any rate to a harmful extent. It was again found in several places in the past summer, and in both seasons rotting of the bulbs was brought about by it. It is important, of course, that bulbs showing any sign of the attack should not be planted, and it might be well to plant, at least for a year or two, newly imported bulbs, whether grown in England or abroad, quite apart from those already in the garden.

Crocus acrius.—Mr. Bowles showed a *Crocus* which has recently been imported under the name of *C. Tauri*, but which appears to be only *C. acrius*, a species native in Persia and described by Herbert in the JOURNAL of the Society in 1847.

Violets with two- or three-flowered Stems.—Mrs. Alma Baker, of Newton Abbot, sent specimens of Violets with two or three flowers on a stem. This mode of flowering occurred in several gardens a few years ago, and was recorded in the Minutes of the Committee, since when it has been observed in many parts of the country.

Propagation of Hemionitis.—Mr. Chittenden showed young plants of this Fern growing from the junction of leaf-stalk and blade after they had been removed from the plant and inserted in sand in a propagating pit, much as is done with Begonia leaves. Young plants are quickly formed, and grow rapidly. In one case a young plant had been found in this position while still attached to the parent plant.

SCIENTIFIC COMMITTEE, FEBRUARY 24, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Azalea amoena.—Mr. W. C. Worsdell, F.L.S., showed double flowers of *Azalea amoena*, and drew attention to the fact that the sepals had become petaloid, giving rise to a "hose-in-hose" flower.

Odontoglossum angustatum.—Mr. R. A. Rolfe, A.L.S., reported that the *Odontoglossum* shown at the last meeting by Mr. H. S. Goodson, of Fairlawn, Putney, was probably a form of *Odontoglossum angustatum* Lindl. It had rather shorter segments and a less-toothed crest, but there are several imperfectly known species described by

Reichenbach in this group (a group of only slight importance in the garden). The present plant may belong to one of these, but Mr. Rolfe could not quite make it fit any of them. More distinct plants, he says, have been referred to *O. angustatum*, and he considers it should be placed there for the present.

Tomatos dying.—Some small Tomato plants were shown from Guernsey, the grower complaining that they had drooped to some extent and looked otherwise unhealthy. The Secretary reported that he had found numerous though very small nodules on their roots inhabited by the "root-knot" eelworm, *Heterodera radicumicola*.

Hybrid scented-leaved Pelargoniums.—Mr. J. Fraser, F.L.S., continued his remarks upon the scented-leaved Pelargoniums in the Wisley collection, and dealt especially with the hybrids of *Pelargonium cucullatum*, *P. angulosum*, and *P. acerifolium*.

Curious Growth of Hyacinth.—Mr. R. C. Notcutt sent a curious Hyacinth with a flower-spike growing downwards into the glass, issuing from the base of the bulb. There was also a normal growth at its apex. A section through the bulb showed an adventitious bud to have developed on the edge of the scale leaf, as often occurs when, as in the present case, the bulb has been injured. This bulb developed a flowering shoot, and this found its way out of the bulb by the easiest path—viz., through the damaged base of the bulb.

Small Narcissus Fly.—Mr. P. D. Williams sent from Cornwall a bulb of Narcissus containing numerous larvæ of the small Narcissus fly, *Eumerus strigatus*. This fly is apparently very destructive to Narcissus bulbs in certain seasons, and has been reported to attack various bulbs, including onions. The Secretary said he had hatched out the flies from rhizomes of Iris attacked by the larvæ. They are allied to *Merodon*, the better-known Narcissus fly, but are much smaller and more like a house-fly in appearance. The larva, with the three projections from the blunt tail end, the middle one of which is red, is also very distinct.

SCIENTIFIC COMMITTEE, MARCH 10, 1914.

Mr. F. A. BOWLES in the Chair, with eleven members present, and Mr. A. R. GOODWIN, visitor.

Narcissus Hybrids.—Mr. A. R. Goodwin showed a hybrid between *Narcissus cyclamineus* and N. 'Golden Spur' flowering now from seed sown four years ago. Like most of the *cyclamineus* hybrids, it has poor, weak foliage, but the concolorous flowers had the broad perianth pieces reflexed, and a long corona, somewhat frilled and expanded at the mouth.

He also showed *N. Leedsii* 'Minnie Hume' × *N. Jonquilla*. This had rush-like foliage as tall as that of 'Minnie Hume,' and the yellowish flowers retained the Jonquil scent, though rather toned down. The hybrid is called 'Fragrance,' and was raised by Mr. Copeland.

Mr. Goodwin referred to the prevalence of the fungus *Fusarium bulbigenum* this year, and thought the only effective method of dealing with it was to lift all plants showing yellowing of foliage, and to remove the remains of bulbs where blanks occurred.

Zizania sp.—Sir John Llewelyn referred to the species of *Zizania* cultivated in England, and said that *Zizania aquatica* always proved an annual, but the plant grown under the name *Z. latifolia* was a perennial. It did not flower, and there had therefore been no opportunity of verifying the name. A plant under that name was mentioned in Gray's "Flora of North America" and was thought to be the same as *Z. miliacea*.

Pelargonium Hybrids.—Mr. J. Fraser, F.L.S., continued his remarks upon the scented *Pelargoniums*, dealing with the forms belonging to *Pelargonium capitatum* and its hybrids.

Intermittent Variegation.—Mr. W. Hales, A.L.S., referred to the matter of intermittent variegation which had been brought to the attention of the Committee some time ago, and said that a plant of *Sedum Telephium*, after showing no signs of variegation for three years, had this year become markedly variegated again.

Small Narcissus Fly.—Mr. C. E. Shea showed numerous specimens of the larvæ of the small Narcissus fly *Eumerus lunulatus* (*E. strigatus*). He said they were proving particularly troublesome in his garden, and that he was lifting all bulbs which failed or showed signs of weakness. A large number of the larvæ was often found in one bulb, up to eighty in one case, and thirty-two in another. Plants growing in the sun appeared to be more liable to attack than those in shade, as is usually the case with bulbs attacked by the large Narcissus fly. He thought it probable that the larvæ travelled from bulb to bulb in the soil.

"*Reversion*" in *Odontioda*.—Mr. R. A. Rolfe, A.L.S., showed a flower of the cross *Odontioda* × *Bradshawiae* 'Cookson's var.' × *Odontoglossum spectabile*, from the collection of Clive Cookson, Esq., Wylam-on-Tyne. The flower closely resembled the *Odontioda* in shape, but the scarlet colour was entirely suppressed. The flower was white, with a few light-brown spots round the yellow crest of the lip, and a little brown spotting at the base of the lateral sepals.

Fasciation in Robinia Pseudacacia.—Mr. Bowles showed a branch of *Robinia* from a garden at Enfield Lock exhibiting this phenomenon.

Axile Proliferation in Quince.—Mr. J. Cheal sent a branch bearing a fruit-like swelling from the apex of which a strong, woody shoot had grown, bearing foliage and buds. The succulent flesh of the fruit had shrunk to small proportions by this date, but in October had been of the usual bright colour and consistence.

Insects attacking Roots.—Mr. W. C. Worsdell, F.L.S., showed soil from a garden in the North containing a great variety of small animals. Among them were numbers of *Collembola*, which were probably the most troublesome of those present.

SCIENTIFIC COMMITTEE, MARCH 24, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and thirteen members present.

Malformed Fuchsia.—Mr. W. C. Worsdell, F.L.S., reported on a malformed flower of *Fuchsia* which had three partly foliaceous sepals, two of which had their stalked bases decurrent down the side of the ovary, one petal in form of a pitcher, with imperfect pollen sacs on one margin, and another petal one-sidedly developed and fused by one edge to the next, with a complete anther at the apex. Two of the stamens were excessively rudimentary, and two others were fused by the whole length of the filaments to the upper side of the half-formed anther-bearing petal.

Small Narcissus Fly.—Mr. F. J. Chittenden, F.L.S., said that, apropos of the suggestion that soaking *Narcissus* bulbs in water for a couple of days would destroy the larvæ of *Eumerus strigatus*, he had kept some submerged in water for 72 hours and after removal from the water they soon became as active as before immersion. [The larvæ which had been immersed subsequently pupated, and flies emerged in May.]

Hippeastrum Hybrid.—Mr. A. Worsley exhibited the flower of a hybrid *Hippeastrum* which had *H. calyptratum* as one of its parents. Like that plant, it had ligular outgrowths near the bases of the perianth pieces, but smaller, and fringed with hair.

Aphides on Picea.—Mr. Chittenden showed specimens of the Aphis [*Aphis abietina* Walker] which has done so much damage to Spruces in some parts of England during the past few years. When the specimens were collected from *Picea pungens glauca* on March 16 the stem-mothers had already produced viviparous young, and had apparently been hatched about three weeks or a month. He had found a nicotine wash, thoroughly applied, the most effective agent in destroying the pest. Attacked trees soon show the needles brownish about the parts attacked by the green-fly, and this is quickly followed by leaf fall. Various species of *Picea* are attacked by the aphids.

SCIENTIFIC COMMITTEE, APRIL 7, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with ten members present, and Mr. F. H. CHAPMAN, visitor.

Abnormal Narcissi.—Mr. W. C. Worsdell, F.L.S., reported upon the abnormal flowers of *Narcissus tridymus* 'de Graaff' as follows: The three sepals were normal. The three petals were partially transformed into stamens. In this process each petal exhibited two main parts—an outer portion, consisting of the upper part of the versatile

anther, with two petaloid lateral extensions; an inner portion consisting of the corona, this latter composed of the lower lobes of the versatile anther with two petaloid lateral extensions (corona proper). In fact, just as there were clear transitions between the upper anther lobes and the ordinary petaloid lamina, so there were still clearer transitions between the basal anther lobes (in some cases upturned, in others deflexed) and the ordinary corona of the petal. These transitional structures demonstrate the homology existing between (1) the "trumpet," or corona, and (2) the upturned basal lobes of a versatile anther which has become petaloid. From which it follows that the perianth of *Narcissus* has been derived in the past from stamens. Celakovsky observed similar phenomena, and deduced the same conclusions, in petaloid stamens of *N. Tazetta*. The stamens and pistil were normal. It is interesting to note that the malformation occurred in 1913 as well as this year. It was very similar to that shown by the specimen sent to the Committee by Sir F. W. Moore last season, and to that which occurred in the garden of Mr. Polman Mooy.

Pollination in Orchards.—Mr. C. H. Hooper sent a communication concerning this matter, with suggestions of experiments and observations.

Narcissus Hybrid.—Mr. F. H. Chapman, of Rye, showed a pretty little hybrid miniature *Narcissus* with the corona slightly paler in tint than the perianth. He had raised it by crossing *N. calathinus* with *N. cyclamineus*, the former being the seed parent. It flowered six years from the sowing of the seed.

Fasciation.—Mr. A. Worsley showed a specimen of *Daphne odora* greatly fasciated, and Sir Daniel Morris a fasciated Primrose.

Pelargonium Hybrids.—Mr. J. Fraser, F.L.S., contributed further remarks upon hybrid scented Pelargoniums, dealing with the group of forms round *P.* × 'Unique.'

Cymbidium madidum.—Mr. J. T. Bennett-Poë, V.M.H., showed an inflorescence of *C. madidum* (= *C. albuciflorum*), a species native in North Australia and rarely seen in cultivation.

Salix Caprea with Pistillody of Stamens.—Mr. Fletcher, of Aldwick Manor, Bognor, Sussex, sent shoots of *Salix Caprea* bearing catkins in which the stamens had become converted into pistils. The example was very similar to that shown by Mr. Bowles in *Salix cinerea* at a previous meeting, and described and figured in R.H.S. JOURNAL, vol. 36 (1910), pp. xxxv, xxxvii, xxxviii.

Leaf Variation in Lonicera japonica.—Mr. F. J. Chittenden, F.L.S., showed a specimen of *Lonicera japonica* with strong young shoots on which the foliage was rather deeply lobed instead of being entire, as in the normal form. Similar changes in form of foliage are frequent in *Symphoricarpos racemosus* in certain stages of growth.

SCIENTIFIC COMMITTEE, APRIL 21, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and fourteen members present.

Salix showed *Carpellody of Stamens*.—Mr. W. C. Worsdell, F.L.S., reported as follows on the curious *Salix cinerea* (not *S. Caprea*, as was at first thought), sent from Bognor by W. B. Fletcher, Esq., to the last meeting :—

“ On a *male* plant some catkins were normal ; most of them had all the flowers female, due to transformation of the two stamens into two carpels, which were quite separate, long-stalked, and contained rudimentary ovules. In a minority of catkins every flower contained two structures transitional between carpels and stamens ; each exhibited a terminal stigma, and bore 2-4 pollen-sacs, which contained pollen. The ovuliferous part of the carpel is homologous with the anther of the stamen, and the stalk of the carpel with the filament of the stamen.”

Mr. Fletcher also sent *Salix alba vitellina*, with aberrant catkins, upon which Mr. Worsdell reported :—

“ An apparently *male* plant originally. The catkins contain for the most part normally-constructed male and female flowers intermingled throughout. Here and there was a flower consisting of two organs transitional between carpels and stamens. In one such flower observed, one of the stamens had become completely transformed into a sessile carpel, while the other was normal save for the presence of a stigma topping the anther ! ”

Grapes sporting.—Mr. J. Hudson, V.M.H., exhibited a bunch of Grapes said to be of the variety ‘ Hemnapoot,’ from the Cape, and sent to him by Mr. Lees, of Watford, with two green berries about twice the size of the normal purple ones at the shoulder of the bunch.

Tasmanian Orchid.—Mr. J. W. Odell showed flowers of the terrestrial Orchid, *Pterostylis curta*, flowering from plants given by him by the late Mr. Andrew Kingsmill. Dr. Rendle, F.R.S., kindly verified the name.

Yarrow Galls.—Mr. Alex. Mortimer, of The Downs, Wimbledon, sent Yarrow (*Achillea Millefolium*) with numerous blackish, round galls upon its creeping stems. The sender had not found these in previous years, though the plants had been examined in weeding. The galls were apparently the work of the gall fly, *Trypeta guttularis*.

Virescent Wallflowers.—Mr. F. J. Chittenden, F.L.S., showed specimens of Wallflowers which had been grown at Wisley, the second generation from the cross of a virescent with a normal Wallflower. In the first generation all the plants were normal ; in F_2 segregation into the two parent forms had occurred in the proportion of 101 normal to 42 virescent. There were no intermediates among the plants. The only variation found was in the number of supernumerary carpels—usually six, but sometimes only four. The numbers approximate to

the 3 to 1 ratio of Mendel's laws, where the expectation would be 107 to 36. (Sec p. 83.)

Abnormal Dendrobium Wardianum.—Mr. Chittenden showed an abnormal flower of *D. Wardianum* from Wisley, which Mr. Worsdell examined and reported upon as follows :—

"Dimerous flower ; two lateral sepals fused into one, which occupies place of labellum, causing the latter to disappear. Lateral petals displaced into a position at right angles to the fore and aft sepals. Column normal."

Gall on Daphne Mezereum.—Mr. W. E. Ledger showed a shoot of *Daphne Mezereum* with numerous gall-like excrescences at the bases of the lateral shoots. Dr. Rendle took them for further examination.

Albino Seedlings of Crinum Moorei.—Mr. H. W. B. Bradley, of Sydney, N.S. Wales, sent two dark and two white seeds of *Crinum Moorei*. He stated that the latter, if sown at once, "will develop ivory-white foliage, but seem to have so little vitality that they die out at the end of the first season. . . . Every year a few albino seeds come without any apparent reason. Generally speaking, all the seeds in a fruit are either albino or normal. Last year, in the same fruit, I had two seeds, one normal, the other albino. Both grew. The normal seed developed a normal plant, with green foliage, which is still alive ; the albino seed an albino plant, now dead. This year seeding of *Moorei* has not been at all free, and I have nearly, if not quite, as many albino as normal seeds ; last season there were very few albinos.

"In 1912 we had very little rain until March, and we then had a superabundance of rain until August, then no rain to be of any service until after *Crinum Moorei* had finished flowering. . . . The season immediately preceding the flowering in 1913 and 1914 was very similar and could have had no effect on the matter, as there were very few albinos in 1913 and more than usual in 1914."

Cuscuta on Ramondia.—The manager of the Burton Hardy Plant Nurseries, Christchurch, sent a plant of *Ramondia pyrenaica*, with a *Cuscuta* on its foliage, not identifiable further, however, on account of the absence of flowers.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 13, 1914.

Mr. J. CHEAL in the Chair, and twelve members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Bunyard, Maidstone, for Apples.

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Award of Merit.

To *Citrus japonica* (votes unanimous), from Messrs. J. Veitch, Chelsea. Fruit very small, less than a golf ball, perfectly round, pale yellow ; skin remarkably thin ; flesh full of pleasantly acid juice, with rather small pips. The tree is a compact and moderate grower, with exceedingly heavy crops of fruit.

Cultural Commendation.

To Mr. H. J. Towell (gr. to Lady Lovelace), Ockham Park, Ripley, for winter-fruited Tomatos.

Other Exhibits.

Mr. W. Camm, Taplow : Apple ' Cliveden Prolific. '

Col. Hon. C. Harbord, Gunton Park, Norwich : Grape ' Melton Constable ' and Pear ' Blickling. '

Messrs. Hartland, Cork : Apple ' April Queen. '

Miss Isaac, Henley : Apple ' Isaac Seedling. '

Messrs. Whitelegg & Page, Chislehurst : Savoy.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 27, 1914.

Mr. J. CHEAL in the Chair, and eleven members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for Potatos.

Silver-gilt Banksian Medal.

To Messrs. Carter, Raynes Park, for vegetables.

Other Exhibits.

Sir Walter Gilbey, Elsenham : jams and lavender water.

Lt.-Col. Rt. Hon. Mark Lockwood, Romford : Apple 'Colonel's Favourite.'

Mrs. Miller, Marlow : preserves.

Mrs. Ridley, Wincanton : Pear 'Catillac.'

Mrs. Sewell, London : preserves.

Messrs. Westmacott, London : bottled Cape fruits.

. FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 10, 1914.

Mr. J. CHEAL in the Chair, and seventeen members present.

Awards Recommended :—*Gold Medal.*

To Messrs. Rivers, Sawbridgeworth, for Oranges.

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Silver Banksian Medal.

To Mrs. Denison (gr. Mr. Gentle), Little Gaddesden, for Potatos.

Bronze Knightian Medal.

To Messrs. Seabrook, Chelmsford, for Apples.

Other Exhibits.

Messrs. Barr, Covent Garden : coloured Kales.

Messrs. Cheal, Crawley : Apple 'Crawley Beauty.'

Mr. W. Peters, Leatherhead : Apple 'Harry Pring.'

Messrs. Westmacott, London : Cape fruits.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 24, 1914.

Mr. J. CHEAL in the Chair, and twelve members present.

Awards Recommended :—*Silver-gilt Banksian Medal.*

To Messrs. Carter, Raynes Park, for Potatos.

Silver Knightian Medal.

To Mrs. Denison (gr. Mr. Gentle), Little Gaddesden, for roots and tubers.

Silver Banksian Medal.

To the Duke of Rutland (gr. Mr. Divers), Grantham, for Grapes and Apples.

I PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Bronze Knightian Medal.

To Mr. W. E. Sands, Hillsborough, for Potatoes.

Other Exhibits.

Mr. W. Crump, Malvern Link : Apples.

Mr. H. Hemsley, Crawley : Apple 'Crawley Beauty.'

Mr. Ruffles, Mapperley : Apple 'Blacksmith.'

Messrs. Westmacott, London : Cape fruits.

FRUIT AND VEGETABLE COMMITTEE, MARCH 10, 1914.

Mr. J. CHEAL in the Chair, and fifteen members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

FRUIT AND VEGETABLE COMMITTEE, MARCH 24, 1914.

Mr. J. CHEAL in the Chair, and sixteen members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. Sutton, Reading, for salads.

Other Exhibits.

Mr. R. Abbey, Framlingham : seedling Apple.

Mr. H. Hemsley, Crawley : Apple 'Crawley Beauty.'

Messrs. R. Veitch, Exeter : Apples.

Messrs. Westmacott, London : Cape fruits.

FRUIT AND VEGETABLE COMMITTEE, APRIL 7, 1914.

Mr. J. CHEAL in the Chair, and eleven members present.

Award Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Other Exhibits.

Messrs. Cheal, Crawley : Apples.

Messrs. Westmacott, London : Cape fruit.

FRUIT AND VEGETABLE COMMITTEE, APRIL 15, 1914.

Mr. C. G. A. NIX in the Chair, and one other member present.

There were no exhibits before the Committee on this occasion.

FRUIT AND VEGETABLE COMMITTEE, APRIL 21, 1914.

Mr. J. CHEAL in the Chair, and nine members present.

Award Recommended :—

Silver-gilt Knightian Medal and Cultural Commendation.

To the Marquis of Salisbury (gr. Mr. Prime), Hatfield, for Strawberries.

Other Exhibit.

Messrs. Westmacott, London : Cape fruit.

FLORAL COMMITTEE.

JANUARY 13, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for Cyclamen.

Silver Flora Medal.

To Rev. H. Buckston (gr. Mr. A. Shambrook), Derby, for Cyclamen.

To Messrs. Cutbush, Highgate, for greenhouse plants.

To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.

To Messrs. May, Upper Edmonton, for ferns.

To Messrs. Wills & Segar, Kensington, for stove and greenhouse plants.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. H. Burnett, Guernsey, for Carnations.

To Messrs. Piper, Bayswater, for alpinas.

To Messrs. Pulham, Elsenham, for alpine shrubs.

To Mr. L. R. Russell, Richmond, for shrubs.

To Messrs. Veitch, Chelsea, for greenhouse plants.

To Messrs. Wallace, Colchester, for shrubs and alpinas.

Bronze Banksian Medal.

To Messrs. Barr, Covent Garden, for bulbous plants.

To Messrs. Cannell, Eynsford, for Pelargoniums.

To Messrs. Ware, Feltham, for alpinas.

Award of Merit.

To Cyclamen 'Mrs. L. M. Graves' (votes, 22 for), from St. George's Nursery Co., Harlington. A very vigorous variety of *Cyclamen persicum*, bearing large carmine flowers in great abundance. The leaves are large and have whitish markings.

Other Exhibits.

Mr. J. Box, Haywards Heath : hardy plants.

Messrs. H. Chapman, Rye : Cyclamen.

Mr. C. Elliott, Stevenage : alpinas.

Misses Hopkins, Shepperton : hardy plants.

Mr. G. Reuthe, Keston : hardy plants.

Messrs. Wells, Merstham : Chrysanthemums and Carnations.

Messrs. Whitelegg & Page, Chislehurst : alpinas and shrubs.

FLORAL COMMITTEE, JANUARY 27, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver Flora Medal.

- To Messrs. Cutbush, Highgate, for greenhouse plants.
- To Mr. C. Engelmann, Saffron Walden, for Carnations.
- To Messrs. May, Upper Edmonton, for epiphytic ferns.
- To Mr. W. Seward, Hanwell, for Cyclamen.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Mr. H. Burnett, Guernsey, for Carnations.
- To Mr. L. R. Russell, Richmond, for shrubs.
- To Messrs. J. Veitch, Chelsea, for greenhouse plants.

Bronze Banksian Medal.

- To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.

Other Exhibits.

- Messrs. Barr, Covent Garden : miscellaneous plants.
- Messrs. Barrie & Brown, London : alpine.
- Mr. J. Box, Haywards Heath : hardy plants.
- Messrs. Carter, Raynes Park : Tulip 'William Copeland.'
- Messrs. Cheal, Crawley : alpine.
- Messrs. Clark, Dover : Polyanthus.
- Messrs. Gill, Falmouth : Rhododendrons &c.
- Misses Hopkins, Shepperton : hardy plants.
- Mr. C. Partridge, Aylesbury : Cinerarias.
- Messrs. Piper, Bayswater : rock garden.
- Misses Price & Fyfe, Lee : Carnations.
- Mr. G. Reuthe, Keston : hardy plants.
- Messrs. Sutton, Reading : Roman Hyacinths.
- Messrs. Wallace, Colchester : rock shrubs.
- Wargrave Plant Farm, London : rock garden.
- Messrs. Whitelegg & Page, Chislehurst : shrubs.
- Messrs. Wills & Segar, Kensington : Azaleas.
- Messrs. Young, Cheltenham : Carnations.

FLORAL COMMITTEE, FEBRUARY 10, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended :—

Gold Medal.

- To Messrs. May, Upper Edmonton, for an educational exhibit of *Nephrolepis fronds*.

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.

Silver Flora Medal.

To Messrs. Low, Bush Hill Park, for greenhouse plants.

To Messrs. Piper, Bayswater, for Azaleas and alpine plants.

To Mr. L. R. Russell, Richmond, for forced shrubs.

To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Barr, Covent Garden, for rockery.

To Messrs. Carter, Raynes Park, for Primulas.

To Messrs. Cheal, Crawley, for rockery.

To Messrs. Cutbush, Highgate, for Carnations and forced shrubs.

To Messrs. Paul, Waltham Cross, for Camellias.

To Mr. G. Reuthe, Keston, for Rhododendrons and alpine plants.

To Messrs. Wills & Segar, Kensington, for Azaleas.

Bronze Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Gill, Falmouth, for Rhododendrons, &c.

To Mr. M. Prichard, Christchurch, for hardy plants.

Bronze Banksian Medal.

To Messrs. Wallace, Colchester, for hardy plants.

Award of Merit.

To Iris 'Cantab' (votes, 16 for), from Messrs. H. Chapman, Ltd., Rye. A charming dwarf Iris raised by E. A. Bowles, Esq., M.A., F.L.S. The flowers are slightly fragrant and resemble those of *I. Krelagei* in form. They are pale blue in colour, while a spotted orange ridge occupies the middle of each fall. The leaves, which are about 6 inches high at flowering time, just overtop the flowers. This Iris is said to be very prolific and of good constitution. (Fig. 30.)

To *Rhododendron Moupinense* (votes, 25 for), from Miss Willmott, V.M.H., F.L.S. (gr. Mr. Fielder, V.M.H.), Great Warley. A dwarf hardy species introduced from China by Mr. E. H. Wilson, V.M.H. The leaves are leathery in texture and ovate in shape, measuring $\frac{3}{4}$ inch broad. They are dark green above and pale green below. The flowers, which are remarkably large for so dwarf a species, measure 2 inches across and are creamy white in colour, while the conspicuous anthers are dull red. This plant appears to be admirably adapted for the rock garden. (Fig. 31.)

Other Exhibits.

Mr. J. Box, Haywards Heath : hardy plants.

Mrs. Bussey, Thetford : Carnations.

Messrs. Cannell, Eynsford : Pelargoniums.

Messrs. Clark, Dover : hardy plants.
 Miss Dixon, Edenbridge : forced bulbs.
 Rev. W. Earle, Reigate : Cyclamen.
 Mr. C. Elliott, Stevenage : rockery.
 Mr. T. Hancock, Mansfield : Tulip 'Thos. Hancock.'
 Misses Hopkins, Shepperton : hardy plants.
 Mr. J. C. Jenner, Rayleigh : Carnations.
 Messrs. Jones, Lewisham : Pelargoniums.
 Mr. G. Kerswill, Exeter : Gentians.
 Mr. G. W. Miller, Wisbech : hardy plants.
 Misses Price & Fyfe, Lee : Carnations.
 Messrs. Sutton, Reading : Freesias.
 Messrs. Tucker, Oxford : alpine plants.
 Messrs. Ware, Feltham : rock garden.
 Wargrave Plant Farm, Ltd., London : hardy plants.
 Messrs. Wells, Merstham : Carnations.
 Messrs. Whitelegg & Page, Chislehurst : rock garden.
 Messrs. Young, Cheltenham : Carnations.

FLORAL COMMITTEE, FEBRUARY 24, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty-five members present.

Awards Recommended :—

Gold Medal.

To Messrs. Cuthbert, Southgate, for Tulips and Lachenalias.

Silver-gilt Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations and forced plants.

To Miss Gundry, Fooks Cray, for floral paintings.

Silver-gilt Banksian Medal.

To Lady Tate (gr. Mr. W. Howe), Streatham Common, for forced bulbs.

Silver Flora Medal.

To Messrs. W. Paul, Waltham Cross, for flowering shrubs.

To Mr. L. R. Russell, Richmond, for forced shrubs.

To Messrs. Sutton, Reading, for Primulas and Freesias.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Barr, Covent Garden, for alpine plants and Daffodils.

To Mr. J. Box, Haywards Heath, for hardy plants.

To Mr. H. Burnett, Guernsey, for Carnations.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. S. Low, Bush Hill Park, for greenhouse plants.

To Messrs. May, Upper Edmonton, for ferns.

To Messrs. Piper, Bayswater, for alpine plants and flowering shrubs.

To Mr. M. Prichard, Christchurch, for hardy plants.
 To Mr. G. Reuthe, Keston, for hardy plants.
 To Messrs. Veitch, Chelsea, for greenhouse plants.
 To Messrs. Ware, Feltham, for alpine.
 To Wargrave Plant Farm, Twyford, for hardy plants.
 To Messrs. Wills & Segar, Kensington, for *Cyclamen* and *Cinerarias*.

Bronze Flora Medal.

To Mr. C. Elliott, Stevenage, for alpine.
 To Guildford Hardy Plant Nursery, for hardy plants.
 To Mr. G. Prince, Longworth, for *Roses*.
 To Messrs. Wallace, Colchester, for hardy plants.
 To Messrs. Whitelegg & Page, Chislehurst, for rockery.

Award of Merit.

To *Freesia* 'Excelsior' (votes, 20 for), from Messrs. Sutton, Reading. Flowers large, deep cream, with yellow blotches on the lower segments of the perianth, strongly scented. This variety is one of the earliest to flower, being three weeks in advance of most *Freesias* already in commerce. It has a strong constitution, and produces vigorous, broad foliage. (Fig. 32.)

To *Sparaxis* 'King George V.' (votes, 22 for, 1 against), from Messrs. Barr, Covent Garden, W.C. Flowers large, measuring $2\frac{1}{2}$ inches across; perianth segments deep blood-red, becoming darker near the middle, below which the colour is bright yellow. The foliage is broad and the plant has a vigorous constitution. The flowers of this variety are considerably deeper in colour and larger in size than those of the variety 'Fire King,' which received an Award of Merit in 1902.

Cultural Commendation.

To F. Lloyd, Esq., Croydon, for a pan of *Saxifraga Burseriana* carrying 350 flowers. (Fig. 33.)

Other Exhibits.

Mr. G. C. Addy, Ightham: *Saxifraga Burseriana major*.
 Messrs. Baker, Codsall: alpine plants.
 Messrs. Barrie & Brown, London: alpine plants.
 Messrs. Bath, Wisbech: Tulips and Daffodils.
 Burton Hardy Plant Nursery, Christchurch: hardy plants.
 Messrs. Carter, Raynes Park: Primulas and Daffodils.
 Messrs. Chapman, Rye: *Freesia* 'Robinetta.'
 Messrs. Cheal, Crawley: alpine plants.
 Messrs. Clark, Dover: hardy plants.
 Mr. A. H. Cole, Swanley: Primulas.
 Messrs. Gill, Falmouth: Rhododendrons, &c.
 Misses Hopkins, Shepperton: hardy plants.
 Messrs. Jackman, Woking: alpine plants.
 Mr. J. C. Jenner, Rayleigh: Carnations.
 Messrs. Jones, Lewisham: Pelargoniums.
 Mr. G. Kerswill, Exeter: *Gentiana acaulis*.



FIG. 30.—IRIS × 'CANTAB' (*Gardeners' Chronicle*)
(p. liv.)

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FIG. 31 RHODODENDRON MOUPINENSE (*Gardeners' Chronicle*)
(p. lxx)



FIG. 32.—FREESIA 'LACE-FOR' (Sutton)

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Pelargoniums.

To R. Fox, Esq. (gr. Mr. Smith), Falmouth, for Rhododendrons.

Award of Merit.

To *Rhododendron* × *Lilianii* (votes, 14 for, 2 against), from R. Fox, Esq. (gr. Mr. S. Smith), Penjerrick, Falmouth. This beautiful Rhododendron was obtained as the result of crossing *R. arborcum rubrum* and *R. Shilsonianii*. The colour is bright blood-red, shaded with carmine, the anthers being chocolate brown. The flowers are campanulate, deeply lobed, and are arranged in compact trusses averaging 18 blooms each. The diameter of the flowers when at their best is 3 inches. The foliage is large and handsome, being deep green above with pale underside. At Falmouth this hybrid Rhododendron has proved quite hardy.

Cultural Commendation.

To F. D. Godman, Esq., South Lodge, Horsham, for *Tecophilaea cyanocrocus*; **F.C.C.** Jan. 10, 1882.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.

Messrs. Baker, Codsall: hardy plants.

Messrs. Barr, Covent Garden: Crocuses.

Messrs. Barric & Brown, London: alpine plants.

Messrs. Bunyard, Maidstone: alpine plants.

Burton Hardy Plant Nursery, Christchurch: alpine plants.

Messrs. Cartwright & Goodwin, Kidderminster: Crocuses.

Messrs. Clark, Dover: hardy plants.

Messrs. Cole, Swanley: Primulas and Cyclamen.

T. M. Dow, Esq., St. Ives: hybrid Hellebores.

Mr. T. H. Gaunt, Farsley: alpine plants.

Guildford Hardy Plant Nursery, Guildford: hardy plants.

Mr. H. Hemsley, Crawley: hardy plants.

Misses Hopkins, Shepperton: hardy plants.

Mr. J. C. Jenner, Rayleigh: Carnations.

Messrs. Jones, Lewisham: Pelargoniums.

Mr. J. J. Kettle, Corfe Mullen: Violets.

N. L. Learmouth, Esq., Blandford: Violets.

Miss Michell, Cricklewood: Hyacinths.

Mr. G. W. Miller, Wisbech: hardy plants.

Mrs. O'Sullivan, London: cut flowers.

Messrs. Carter Page, London: bulbs in bowls.

Mr. F. F. Paul, Botley: winter-flowering Sweet Peas and Carnation 'Belladonna.'

Misses Price & Fyfe, Lee: Carnations.

Mr. M. Prichard, Christchurch: hardy plants.

Mr. G. Prince, Longworth: Roses.

Messrs. Reamsbottom, Geashill: Anemones.

Messrs. Thompson & Charman, Bushey : hardy plants.
 Messrs. Tucker, Oxford : alpine plants.
 Messrs. Wells, Merstham : Carnations.
 Mr. F. West, Basingstoke : Primulas.

FLORAL COMMITTEE, MARCH 24, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and thirty-two members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Hill, Lower Edmonton, for Ferns.

To Messrs. Veitch, Chelsea, for forced shrubs and greenhouse plants.

Silver-gilt Banksian Medal.

To Messrs. Piper, Bayswater, for alpine plants.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To Messrs. Cutbush, Highgate, for forced shrubs and Carnations.

To Mr. G. Pince, Longworth, for Roses.

Silver Banksian Medal.

To Viscountess Knutsford (gr. Mr. Goldstone), Royston, for Hippeastrums.

To Messrs. S. Low, Enfield, for Carnations &c.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Messrs. W. Paul, Waltham Cross, for flowering shrubs.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Mr. L. R. Russell, Richmond, for Clematis.

To Messrs. Young, Cheltenham, for Carnations.

Bronze Flora Medal.

To Messrs. Barr, Covent Garden, for rockery.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Whitelegg & Page, Chislehurst, for rockery.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Baker, Wolverhampton, for hardy plants.

To Messrs. Brown, Peterborough, for Roses.

To Messrs. Cheal, Crawley, for alpine plants.

To Messrs. Clark, Dover, for hardy plants.

To Messrs. Cole, Swanley, for Cinerarias.

To Mr. C. Elliott, Stevenage, for alpine plants.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Misses Hopkins, Shepperton, for hardy plants.

To Messrs. Peed, Norwood, for flowering shrubs.

To Mr. G. Reuthe, Keston, for hardy plants.

- To Messrs. Thompson & Charman, Bushey, for hardy plants.
 To Mr. C. Turner, Slough, for flowering shrubs.
 To Messrs. Ware, Feltham, for hardy plants.
 To Messrs. Waterer, Sons & Crisp, London, for hardy plants and shrubs.
 To Messrs. Wills & Segar, Kensington, for greenhouse plants.

Award of Merit.

To Rhododendron 'Littleworth Hybrid' (votes, 17 for, 4 against) from Miss Mangles, Littleworth, Farnham. A very fine Rhododendron resembling *R. argenteum*. The truss exhibited carried about thirty large campanulate sulphury-white flowers, having a small purple blotch at the base of the bell. The anthers are mostly absent or aborted, and the conspicuous stigma is pink. The leaves are large, dark green above and silvery white beneath.

To *Soldanella pusilla alba* (votes, 20 for), from Messrs. T. S. Ware, Feltham. A charming little alpine, bearing white campanulate flowers with neatly notched margins. There are violet markings in the interior of each bell. The scape is usually one-flowered and about 3 inches tall. The leaves are cordate-reniform in shape. (Fig. 34.)

To *Trillium rivale* (votes, 14 for), from Mr. J. Box, Haywards Heath. This plant is the smallest of the American Wood Lilies. The small flowers are white, dotted with rose, and are borne on slender stems about 3 inches high.

Cultural Commendation.

To Mr. W. Bain (gr. to Elizabeth, Lady Lawrence, Dorking), for blooms of *Lapageria rosea* 'The Knoll' variety. **A.M.** 1899.

To Mr. W. Emerton (gr. to Earl Brownlow, Grantham), for *Brownea grandiceps* in flower. **F.C.C.** 1866.

Other Exhibits.

- Burton Hardy Plant Nursery, Christchurch : hardy plants.
 Messrs. Cannell, Eynsford : Pelargoniums.
 Miss Grover, Speldhurst : Violets.
 Guildford Hardy Plant Nursery, Guildford : for hardy plants.
 Mr. P. S. Hayward, Clacton : Viola 'Felix.'
 Mr. H. Hemsley, Crawley : hardy plants.
 Messrs. Jones, Lewisham : Pelargoniums.
 Mr. J. J. Kettle, Corfe Mullen : Violets.
 E. J. P. Magor, Esq., St. Tudy R.S.O. : Rhododendrons.
 Mr. G. W. Miller, Wisbech : hardy plants.
 Mrs. O'Sullivan, Westminster : bulbous plants.
 Messrs. Carter Page, London : Violas.
 Mr. R. Prichard, West Moors : alpine plants.
 Messrs. Reamsbottom, Geashill : Anemones.
 Messrs. Wells, Merstham : Carnations.

FLORAL COMMITTEE, APRIL 7, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—*Silver-gilt Lindley Medal.*

To Lt.-Col. Rt. Hon. Mark Lockwood, C.V.O., M.P. (gr. Mr. Craddock), Romford, for Gardenias.

Silver-gilt Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

Silver-gilt Banksian Medal.

To Messrs. Piper, Bayswater, for rockery.

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations and alpinas.

To Messrs. Cuthbert, Southgate, for forced shrubs.

To Mr. G. Prince, Longworth, for Roses.

To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. J. Box, Haywards Heath, for hardy plants.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. Low, Bush Hill Park, for Carnations.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Mr. M. Prichard, Christchurch, for hardy plants.

Bronze Flora Medal.

To Messrs. Reamsbottom, Geashill, for Anemones.

To Mr. G. Reuthe, Keston, for hardy plants.

To Mr. L. R. Russell, Richmond, for flowering shrubs.

To Messrs. Ware, Feltham, for hardy plants.

To Messrs. Young, Cheltenham, for Carnations.

Bronze Banksian Medal.

To Mr. J. Jenner, Rayleigh, for Carnations.

To Messrs. Jones, Lewisham, for Pelargoniums.

To Mr. P. Ladds, Swanley Junction, for miscellaneous plants.

To Messrs. Whitelegg & Page, Chislehurst, for rockery.

First-class Certificate.

To *Clematis Armandii* (votes, unanimous), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A very fine evergreen climbing species introduced from China by Mr. E. H. Wilson, V.M.H. The trifoliate leaves are dark green and leathery. The pure white flowers, which measure 2 inches in diameter, are borne in dense axillary clusters. The plant is hardy, very strong in growth, and blooms very freely, commencing early in April. (Fig. 35.)

Award of Merit.

To *Anthurium conchiflorum* (votes, 10 for, 1 against), from Elizabeth, Lady Lawrence (gr. Mr. Bain), Dorking. A beautiful hybrid between *A. Scherzerianum* and *A. Chamberlainianum*, with deep scarlet shell-shaped spathes and twisted spadices. The leaves are large and handsome, being a foot long by 5 inches in width.

To Auricula 'Gordon Douglas' (votes, unanimous), from Mr. J. Douglas, Great Bookham. A good fancy Auricula, bearing a fine truss of golden-apricot flowers of good size and form. The eye is surrounded by a broad white paste.

To *Columnnea glabra major* (votes, 15 for), from Elizabeth, Lady Lawrence (gr. Mr. Bain), Dorking. A handsome stove plant, suitable for growing in baskets. The growths are pendulous and fleshy, while the leaves are thick and glossy, being ovate-lanceolate in shape. The tubular flowers are bright red, and are borne in the axils of the leaves.

To *Osmanthus Dclavayi* (votes, unanimous), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A dwarf Chinese evergreen shrub bearing numerous axillary clusters of pure white tubular flowers, which are very fragrant and are said to remain open for a long time. The leaves are small, dull green, ovate-acuminate, dentate. The plant has proved hardy in this country. (Fig. 36.)

To Primula 'Bookham Gem' (votes, unanimous), from Mr. J. Douglas, Great Bookham. This beautiful plant was obtained by crossing two (*Primula viscosa* × Auricula var.) hybrids. The flowers measure 1½ inch across and are borne in a large truss. The colour is deep bright violet purple, and the small eye is white.

To *Prunus Pissardii Bliricana fl. pl.* (votes, 20 for), from Mr. R. C. Notcutt, Woodbridge. A beautiful free-flowering tree, bearing semi-double pale rose-pink blooms measuring 1½ inch across. The shoots are of a dark purplish colour, and the foliage is purple-tinted as in the type. (Fig. 37.)

To *Rhododendron fastigiatum* (votes, 15 for), from Mr. G. Reuthe, Keston. A charming dwarf shrubby species from North China. The flowers are borne very freely and are of a bluish-lilac shade. The anthers are very prominent and the petals are prettily crenated. The small ovate leaves are closely crowded and overlap considerably.

To Rose 'Constance' (votes, unanimous), from Messrs. Beckwith, Hoddesdon. A beautiful Pernetiana hybrid which in form and habit is a great advance on 'Rayon d'Or,' which it resembles in its golden-yellow colour and crimson tinting on the outer petals. The buds are finely pointed, and the blooms possess a pleasing fragrance.

Other Exhibits.

Messrs. Baker, Codsall : hardy plants.

Messrs. Barr, Taplow : rockery.

Messrs. Blackmore & Langdon, Bath : Polyanthus.

Burton Hardy Plant Nursery, Christchurch : alpins.

Messrs. Cannell, Eynsford : Pelargoniums.

- Messrs. Cheal, Crawley : rockery.
 Lt.-Col. S. Clarke, Cuckfield : unnamed *Gloriosa*.
 Messrs. Cole, Swanley : *Cinerarias*.
 Mr. W. Easlea, Eastwood : Rose 'Cherry Page.'
 Mr. C. Elliott, Stevenage : rockery.
 Guildford Hardy Plant Nursery, Guildford : hardy plants.
 Mr. P. S. Hayward, Clacton-on-Sea : *Violas*.
 Mr. V. T. Hill, Langford : hardy plants.
 Misses Hopkins, Shepperton : hardy plants.
 Messrs. Jackman, Woking : hardy plants.
 Messrs. Jarman, Chard : *Cinerarias*.
 Messrs. Kelway, Langport : *Cheiranthus alpinus* 'Langport Purple.'
 Mr. J. J. Kettle, Corfe Mullen : *Violets*.
 Mr. J. MacDonald, Harpenden : grass.
 W. Mappin, Esq., Sheffield : *Agapetes macrantha*. **F.C.C.** 1860.
 Mr. G. W. Miller, Wisbech : hardy plants.
 Messrs. Carter Page, London : *Violas*.
 Messrs. G. Paul, Cheshunt : *Lachenalias*.
 Messrs. Phillips & Taylor, Bracknell : hardy plants.
 Countess of Strathmore, Welwyn : *Anemones*.
 Messrs. Thompson & Charman, Bushey : alpinas.
 Messrs. Tucker, Oxford : alpinas.
 Messrs. Waterer & Crisp, London : shrubs and alpinas.
 Messrs. Watkins & Simpson, London : *Primula malacoides*
superba.
 Mr. J. D. Webster, Chichester : *Carnations*.
 Miss E. Willmott, V.M.H., Great Warley : *Primula Listeri* and
Anemone Pulsatilla 'Warley var.'
 Messrs. Wills & Segar, Kensington : greenhouse plants.

FLORAL COMMITTEE, APRIL 15, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and eleven members present

Awards Recommended :—

Gold Medal.

To Messrs. Carter, Raynes Park, for a bank of Daffodils and shrubs.

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for miscellaneous flowering plants.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Mr. C. Engelmann, Saffron Walden, for *Carnations*.

To Mr. L. R. Russell, Richmond, for alpinas.

Bronze Flora Medal.

- To Messrs. Cutbush, Highgate, for Azaleas &c.
- To Messrs. Low, Enfield, for New Holland plants.
- To Messrs. Reamsbottom, Geashill, for Anemones.
- To Messrs. Waterer & Crisp, London, for alpinas and shrubs.

Bronze Banksian Medal.

- To Messrs. Barr, Taplow, for rockery.
- To Messrs. Whitelegg & Page, Chislehurst, for alpinas.
- To Messrs. Wills & Segar, Kensington, for miscellaneous plants.

Award of Merit.

To *Amygdalus persica rosea fl. pl. pendula* (votes, unanimous), from Mr. L. R. Russell, Richmond. This charming Japanese shrub was exhibited as a 6-ft. weeping standard, carrying large numbers of bright cerise-pink semi-double blossoms measuring $1\frac{1}{2}$ inch across.

To *Primula 'Ville de Nancy'* (votes, unanimous), from Messrs. Piper, Bayswater. A handsome garden variety, closely resembling *P. Veitchii* in habit. The flowers are rosy magenta in colour and are prettily crinkled at the margin. They are borne in close umbels of about a dozen flowers, on stalks 6 to 9 inches high.

Other Exhibits.

- Mr. C. Elliott, Stevenage: alpinas.
- Mr. E. J. Hicks, Hurst: Rose 'Princess Mary.'
- Mr. J. J. Kettle, Corfe Mullen: Violets.

FLORAL COMMITTEE, APRIL 21, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Gold Flora Medal.

To Lt.-Col. Sir George Holford (gr. Mr. Chapman), Tetbury, for *Hippeastrums*.

Silver Flora Medal.

- To Mr. J. Box, Haywards Heath, for hardy plants.
- To Messrs. B. R. Cant, Colchester, for Roses.
- To Messrs. Cutbush, Highgate, for Carnations and Roses.
- To Mr. J. Douglas, Great Bookham, for Auriculas.
- To Messrs. Low, Bush Hill Park, for Carnations.
- To Messrs. May, Upper Edmonton, for Ferns and flowering plants.
- To Messrs. Piper, Bayswater, for rockery.
- To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Mr. H. Burnett, Guernsey, for Carnations.
- To Messrs. Cheal, Crawley, for flowering trees and shrubs.

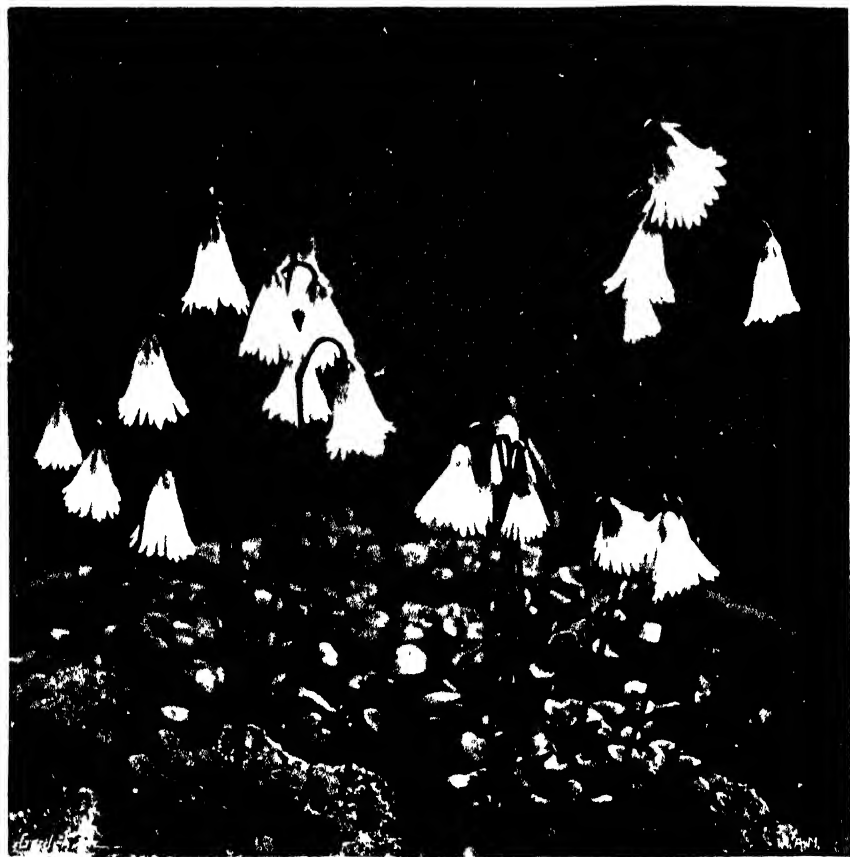


FIG. 31. *SORDANIELLA FUSCA ALBA* (Gardner & Chomicki)
(sp. nov.)

(To face p. cxix)



FIG. 35.—CLEMATIS ARMANDII (*Gardeners' Magazine*)
(p. lxi.)



FIG. 36.—*OSMANTHUS DELAVAYI* (*Gardeners Magazine*).
(p. 128.)



FIG. 37.—*PRUNUS PISSARDII* BLIERIANA.

(p. lxii)

[To face p. lxx

To Mr. C. Engelmann, Saffron Walden, for Carnations.
 To Mrs. Lloyd Edwards, Llangollen, for Saxifrages, &c.
 To R. McConnell, Esq., Bromley, for Cinerarias.
 To Messrs. Phillips & Taylor, Bracknell, for Auriculas and alpinas.

To Mr. M. Prichard, Christchurch, for hardy plants
 To Mr. G. Reuthe, Keston, for Rhododendrons, &c.
 To Messrs. Sutton, Reading, for Cinerarias.
 To Mr. A. Turner, Slough, for Lilacs.
 To Messrs. Ware, Feltham, for alpinas.
 To Messrs. Waterer, Sons & Crisp, London, for alpinas
 To Messrs. Webb, Stourbridge, for Cinerarias.
 To Messrs. Wills & Segar, Kensington, for greenhouse plants.

Bronze Flora Medal.

To Messrs. Clark, Dover, for hardy plants.
 To Messrs. Jackman, Woking, for hardy plants and Clematis.
 To Lt-Col Rt. Hon. Mark Lockwood (gr. Mr. Craddock), Romford, for Gardenias and Schizanthus.
 To Mr. R. Prichard, West Moors, for alpinas.
 To Messrs. Tucker, Oxford, for alpinas.

Bronze Banksian Medal.

To Messrs. Bunyard, Maidstone, for alpinas.
 To Misses Hopkins, Shepperton, for hardy plants.
 To Messrs. Reamsbottom, Geashill, for Anemones.

Award of Merit.

To *Antirrhinum* 'Nelrose' (votes, 14 for, 5 against), from Messrs. Wells, Merstham. A perpetual-flowering variety, of great value for cutting. The flowers are large and of a delicate pink colour, while the lower lip is tipped with yellow. The spikes are of medium length and well furnished.

To *Arabis aubrietioides* 'Trevor Seedling' (votes, 16 for), from Mrs. Lloyd Edwards, Llangollen. The flowers of this variety are larger than those of the type and are also deeper in colour, being pale reddish-violet (*Répertoire de Couleurs*). The plant is very free-flowering in habit.

To *Campanula cenisia alba* (votes, 11 for), from Messrs. Tucker, Oxford. A charming dwarf alpine bearing white, solitary, terminal flowers on slender stalks from 1 to 1½ inch long. The small light-green ovate leaves, measuring about ¼ inch broad, are borne in compact rosettes. The flowers, when fully open, measure 1 inch across.

To *Clematis montana superba* (votes, 18 for), from Messrs. Jackman, Woking. This variety was obtained as the result of a cross between *C. montana* and *C.* 'Mrs. George Jackman.' The flowers are much larger than those of the type, being 3 inches across and having four white perianth segments borne in the form of a cross. The plant is very free-flowering in habit. (Fig. 38.)

To *Hydrangea* 'Lillie Mouillière' (votes, 10 for, 3 against), from Messrs. Low, Bush Hill Park. A very handsome variety, of compact, bushy habit. The flowers are large and of a beautiful rose-pink colour, which becomes paler towards the margin.

To *Polyanthus* 'Orange King' (votes, 11 for, 3 against), from Mrs. Ellis, Lincoln. This very robust-growing variety has large flowers of a deep orange colour, with a reddish-orange reverse. The margins are prettily crinkled.

To *Pyrus Malus floribunda purpurea* (votes, 15 for, 4 against), from Mr. R. C. Notcutt, Woodbridge. A very distinct-flowering Crab, bearing purplish-rose flowers in great profusion. The foliage is bronze in colour, and the bark is purple-tinted.

Other Exhibits.

Messrs. Barr, Taplow : rockery.

Burton Hardy Plant Nursery, Christchurch : alpines.

Messrs. Cannell, Eynsford : Pelargoniums.

Messrs. Cocker, Aberdeen : Primulas.

Messrs. Cole, Swanley : Pelargoniums.

Mr. J. Crook, Camberley : Auriculas.

Mr. C. Elliott, Stevenage : rockery.

Messrs. Gill, Falmouth : Rhododendrons.

Guildford Hardy Plant Nursery, Guildford : hardy plants.

Messrs. Jones, Lewisham : Pelargoniums.

Mr. G. Kerswill, Exeter : Gentians, &c.

Mr. P. Ladds, Swanley Junction : flowering plants.

Messrs. Carter Page, London : Violas.

Mr. G. W. Piper, Uckfield : *Verbena chamaedrioides*.

Mr. L. R. Russell, Richmond : Japanese Maples.

Mr. V. Slade, Taunton : Pelargoniums.

Messrs. Smith, Guernsey : Rhododendron 'Charles Smith.'

Messrs. Stark, Great Ryburgh : *Polyanthus* 'Sulphur King.'

Messrs. Thompson & Charman, Bushey : hardy plants.

P. Murray Thomson, Esq., Mealsgate : double Primroses.

Messrs. Wallace, Colchester : hardy plants.

Messrs. Whitelegg & Page, Chislehurst : hardy plants.

Miss Willmott, V.M.H., Great Warley : *Rhododendron warleyense* and *Aethionema* 'Warley Hybrid,' A.M. 1913.

ORCHID COMMITTEE.

JANUARY 13, 1914.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mrs. Raphael, Castle Hill, Englefield Green, for *Cypripediums* and *Calanthes*.

Silver Flora Medal.

To Messrs. Flory & Black, Slough, for hybrids.

To Messrs. Sander, St. Albans, for *Laelia Gouldiana* and hybrid Orchids.

Silver Banksian Medal.

To Messrs. Armstrong & Brown, for *Laeliocattleyas* and *Odontoglossums*.

To Messrs. J. Cypher, for a group.

To Messrs. W. Baylor Hartland, for *Cypripediums*.

To Mr. G. W. Miller, Wisbech, for *Cypripediums*.

First-class Certificate.

To *Cypripedium* × 'Julian' ('Vandyke' × *aureum* 'Oedippe') (votes, 7 for, 3 against), from Lieut.-Col. Sir Geo. L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Flowers large, dorsal sepal white with a small green base, and some purple lines. Petals and lip honey-yellow, marked with purple.

Award of Merit.

To *Odontioda* × 'Royal Gem,' Westonbirt var. (*Odontoglossum* × *ardentissimum* × *Odontioda* × *Vuykstekeae*) (votes, 10 for, 1 against), from Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. Of good shape, and unique in colour. Flowers rose-tinted copper. Lip reddish rose with yellow crest.

To *Odontoglossum* × *illustrissimum*, Dell variety (*Lambeauianum* × *ardentissimum*) (votes unanimous), from Baron Bruno Schröder (gr. Mr. J. E. Shill). Sepals and petals dark claret colour, with lighter tips. Lip white, with red blotches around the yellow crest.

To *Odontoglossum* × 'Canary' (*oakwoodiense* × *ardentissimum*) (votes unanimous), from Pantia Ralli, Esq., Ashted Park. Flowers equal to *O. crispum*, canary-yellow, with a few dark spots.

To *Cymbidium* × *Schlegelii punctatum* (*insigne* × *Wiganianum*), (votes, 14 for, 2 against), from Pantia Ralli, Esq. Flowers large, cream-white, with dark red spotting on the petals and lip.

To *Cymbidium* \times *Coningsbyanum* (*grandiflorum* \times *insigne*) (votes, 14 for, 6 against), from G. Hamilton-Smith, Esq., Finchley (gr. Mr. Coningsby). Formed like *C. grandiflorum* (*Hookerianum*); greenish-white, with cream-white lip, having red spotting

Other Exhibits.

His Grace the Duke of Marlborough (gr. Mr. Hunter): *Cypripedium* \times 'Iona' (*bellatulum* \times *Fairrieanum*).

Lieut.-Col. Sir Geo. L. Holford: hybrids.

Baron Bruno Schröder: *Cypripediums*.

Pantia Ralli, Esq.: *Odontioda* \times *keighleyensis* 'Firefly.'

E. H. Davidson, Esq.: *Odontoglossums*.

A. J. Hollington, Esq.: hybrid *Cypripedium*.

Messrs. Hassall: hybrids.

ORCHID COMMITTEE, JANUARY 27, 1914.

Mr. J. GURNEY FOWLER in the Chair, and twenty-four members present.

Awards Recommended :—

Silver Flora Medal.

To Mrs. Norman Cookson, Oakwood, Wylam (gr. Mr. H. J. Chapman), for *Odontiodas* and *Odontoglossums*.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Cattleyas*, *Laeliocattleyas*, and *Odontoglossums*.

To Messrs. Charlesworth, Haywards Heath, for hybrid *Odontoglossums* and other Orchids.

To Messrs. Sander, St. Albans, for a varied group.

To Messrs. J. & A. McBean, Cooksbridge, for a fine group of hybrids of *Cymbidium* *insigne*.

Silver Banksian Medal.

To Messrs. Flory & Black, Slough, for a group of hybrid *Cypripediums*, *Brassocattleyas*, &c.

To Messrs. J. Cypher, Cheltenham, for a group of *Cypripediums* and *Masdevallias*.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for showy Orchids.

First-class Certificate.

To *Cattleya* \times 'Tityus' var. 'A. McBean' ('Enid' \times 'Octave Doin') (votes unanimous), from Messrs. McBean, Cooksbridge. An effective combination of *C. Mossiae*, *C. Warscewiczii*, *C. Mendelii*, and *C. Dowiana aurea*, with large broad-petalled flowers of a bright rose-purple, with ruby-crimson lip.

Award of Merit.

To *Odontioda* \times 'Doris' (*Odontioda* \times *Cooksoniae* \times *Odontoglossum* \times *amabile* (votes, 12 for, 2 against), from Mrs. N. Cookson, Wylam (gr. Mr. H. J. Chapman). Flowers of good shape; white ground;

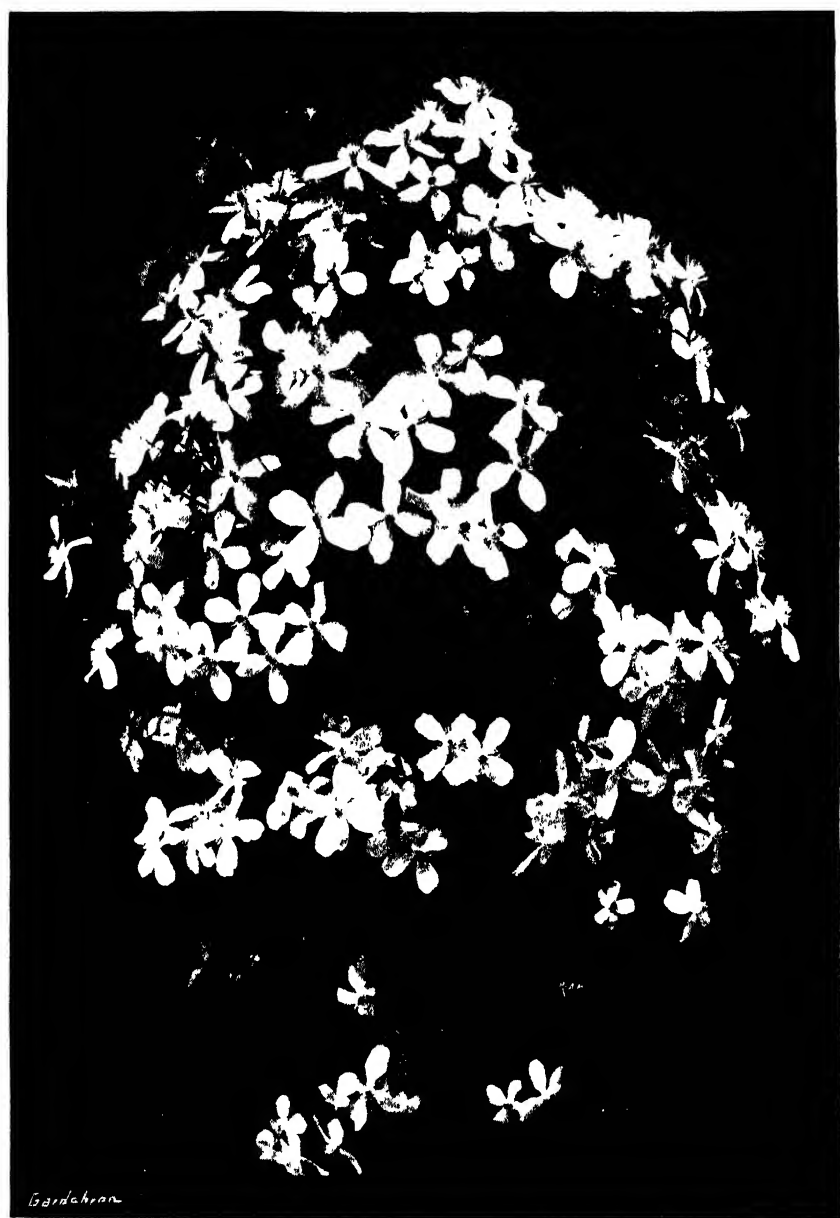


FIG. 38 -- CLIMATIS MONTANA SUPERBA (*Gardener's Chronicle*)
(p. 184.)

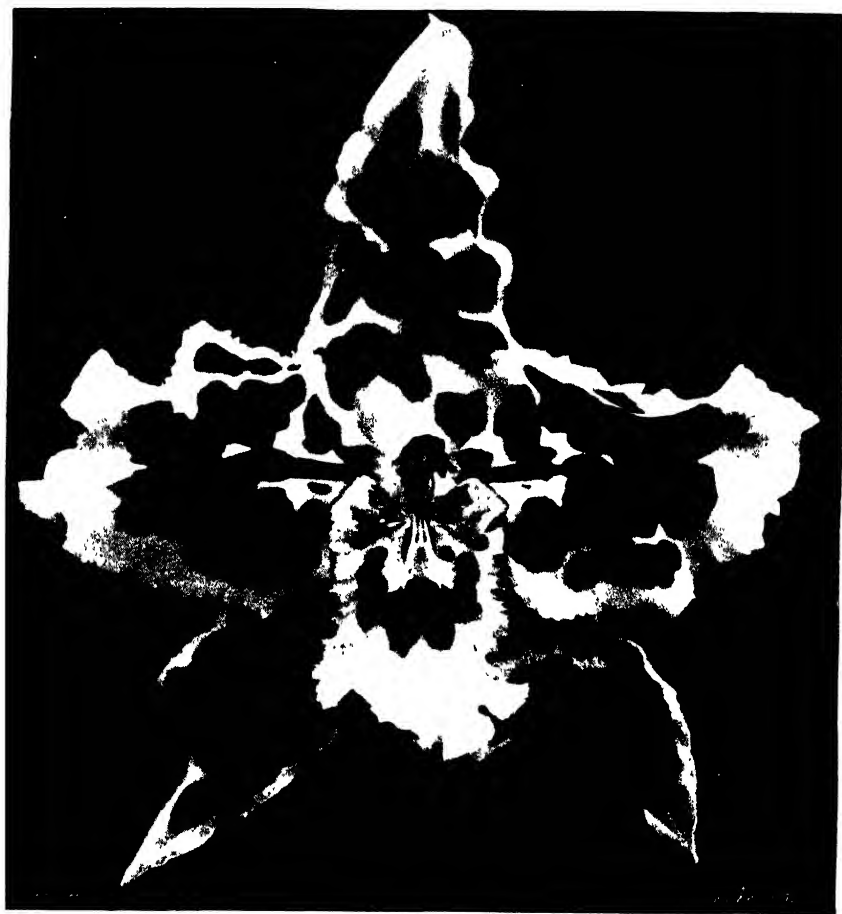


FIG. 39 —*ODONTOGLOSSUM* × 'COLOSSUS' (*Gardeners' Chronicle*)
(p. lxxi.)

fringed petals blotched with red and tinged on the margins with lilac.

To *Odontioda* \times 'Sibyl' (*Odontioda* \times *Bradshawiæ* \times *Odontoglossum* hybrid) (votes unanimous), from Mrs. N. Cookson. Flowers of a uniform claret colour, with narrow white margin.

To *Cypripedium* \times 'Desdemona' ('Mrs. Cary Batten' \times 'Alciabiades') (votes unanimous), from Messrs. Charlesworth. A shining yellow flower, of good shape, with blackish markings on the dorsal sepal and petals. Tip of the sepal white.

Cultural Commendation.

To Mr. J. E. Shill (gr. to Baron Bruno Schröder), for three very large specimens of *Cymbidium Panawelsii*.

To Messrs. Charlesworth, for a fine specimen of *Odontoglossum amabile*.

Other Exhibits.

Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. : two new hybrids.

G. C. Roebling, Esq. : *Laelia anceps* *Roeblingiana*.

H. T. Pitt, Esq. : hybrids.

Pantia Ralli, Esq. : *Cymbidium Goltianum*.

Francis Wellesley, Esq. : *Cypripedium westfieldense*.

Messrs. Hassall : *Brassocattleyas* &c.

Messrs. Swan & Price : *Cypripediums*.

Messrs. W. A. Manda : *Cattleya Trianæ* in variety

ORCHID COMMITTEE, FEBRUARY 10, 1914

Mr. J. GURNEY FOWLER in the Chair, and twenty-five members present.

Awards Recommended : —

Gold Medal.

To Lieut.-Col. Sir Geo. L. Holford, K.C.V.O., Westonbirt, Tetbury (gr. Mr. H. G. Alexander), for a magnificent group of hybrid Orchids arranged with *Cymbidiums*, white *Laelia anceps*, &c.

Silver Flora Medal.

To Messrs. E. H. Davidson, Twyford, for rare hybrids.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Laelio-cattleyas* and hybrid *Odontoglossums*.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for varieties of *Cattleya Trianæ*, &c.

To Messrs. J. Cypher, Cheltenham, for *Cypripediums* &c.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrid *Odontoglossums*.

First-class Certificate.

To *Cypripedium* × 'Pyramus' ('Hera Euryades' × 'Mrs. Wm. Mostyn') (votes 14 for, 6 against), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Dorsal sepal white, with large rose-purple blotches. Lip and petals broad, pale yellow, with dark mahogany-red surface.

To *Dendrobium* × 'Lady Colman' ('Artemis' × *Findlayanum*) (votes unanimous), from Sir Jeremiah Colman, Bt., V.M.H. (gr. Mr. Collier). One of the largest and best *Dendrobiums*, with white flowers, tinged with rose-pink, the yellow disc of the lip having a heavy maroon blotch.

Award of Merit.

To *Cymbidium* × *Gottiarum*, Westonbirt variety (*eburneum* × *insigne*) (votes unanimous), from Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. Flowers large, white, tinged with pink. Lip spotted with purple.

To *Odontioda* × 'Margaret,' Westonbirt variety (*Odontoglossum* × *ardentissimum* × *Odontioda* × *Bradshawiae*) (votes unanimous), from Lieut.-Col. Sir Geo. L. Holford. Flowers deep red, with pale yellow markings on the petals and lip.

To *Cattleya Trianae* 'Mrs. de B. Crawshay' (votes unanimous), from Baron Bruno Schröder (gr. Mr. J. E. Shill). A large rose-pink flower, with purplish-crimson front to the lip.

To *Cattleya Trianae* 'Mrs. Phillips' (votes unanimous), from C. J. Phillips, Esq., Sevenoaks. A remarkable form, with claret-red bands on the sepals, and a broader band of the same colour on the petals. Front of lip claret-red.

To *Cymbidium* × *Schlegeli*, Southfield variety (*insigne* × *Wiganianum*) (votes, 13 for, 2 against), from W. Waters Butler, Esq., Edgbaston (gr. Mr. Jones). A handsome, large form, with blush-white flowers, the lip having reddish-purple spots.

To *Odontonia* × 'Lucilia' (*O. cirrhosum* × *M. spectabilis Moreliana*) (votes unanimous), from Messrs. Charlesworth. Spike erect. Flowers with nearly equal lanceolate segments, rosy-lilac, with claret-coloured markings.

To *Odontioda* × 'Diana' var. 'Gladys' (*O.* × *amabile* × *C. Noezliana*) (votes unanimous), from Messrs. McBean. A bright red flower, with yellow crest to the lip.

Other Exhibits.

Lieut.-Col. Sir Geo. L. Holford : new hybrids.

Baron Bruno Schröder : form of *Cattleya Trianae*.

Sir Jeremiah Colman, Bt. : rare Orchids.

H. S. Goodson, Esq. : *Sophronitis* hybrids.

De B. Crawshay, Esq. : *Odontoglossum* × 'Boadicea.'

Mrs. Thatcher : *Brassavola glauca*.

Mr. W. A. Manda : *Cattleya Trianae* varieties.

Messrs. Swan & Price : *Cypripediums*.

Messrs. McBean : hybrids.

Mr. H. Dixon : *Odontoglossums*.

ORCHID COMMITTEE, FEBRUARY 24, 1914.

Sir HARRY J. VEITCH in the Chair, and twenty-five members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Lieut.-Col. Sir Geo. L. Holford, K.C.V.O., Westonbirt, Tetbury, for a group of varieties of *Cattleya Trianae* and other Orchids.

Lindley Medal.

To Mr. H. G. Alexander, Orchid-grower to Lieut.-Col. Sir Geo. L. Holford, for three grandly cultivated specimens, viz. :—

Cattleya Trianae 'Hydra,' 96 flowers.

Cymbidium Lowie-eburneum, 26 spikes, 101 flowers.

Cymbidium Lowianum, 15 spikes, 278 flowers.

Silver Flora Medal.

To Messrs. Sander, for hybrid *Odontoglossums*, *Cattleyas*, &c.

To Messrs. Stuart Low, for a group.

Silver Banksian Medal.

To Messrs. Armstrong & Brown, for hybrids.

To Messrs. Charlesworth, for a group.

To Messrs. J. Cypher, for *Cypripediums*.

Bronze Banksian Medal.

To Messrs. Flory & Black, Slough, for hybrids.

To Messrs. Hassall, Southgate, for a group.

To Messrs. Swan & Price, St. Albans, for *Cypripediums*.

First-class Certificate.

To *Odontoglossum* × 'Colossus' (parentage unrecorded) (votes unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). The largest of its class ; flowers white, with the greater part of the segments heavily blotched with dark purple. (Fig. 39.)

To *Cymbidium* × *Alexanderi*, Hamilton-Smith's variety (*insigne* × *eburneo-Lowianum*) (votes unanimous), from G. Hamilton-Smith, Esq., Finchley. Flowers white, with an irregular crimson band at the margin of the lip. (Fig. 40.)

Award of Merit.

To *Cypripedium* × 'Mogul' ('Mrs. Wm. Mostyn' × *chrysotoxum*) (votes unanimous), from Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Flowers yellow, tinged with purple, the ivory-white dorsal sepal having a purple band up the middle.

To *Laeliocattleya* × 'Ariel' (*C. Dowiana aurea* × *L. Cowanii*) (votes unanimous), from Lieut.-Col. Sir Geo. L. Holford. Flowers six to ten on a tall spike, salmon-red, with ruby-red lip.

To *Phalaenopsis* × 'Ariadne' ('Aphrodite' × *Stuartiana*) (votes unanimous), from Messrs. Sander, St. Albans. Flowers white, with the spotting on the lateral sepals as in *P. Stuartiana*. The variety shown was an imported natural hybrid. The original was raised by Messrs. Jas. Veitch, and flowered by them in 1896.

Other Exhibits.

Dr B. Crawshay, Esq. : *Odontoglossums*.

Mons. Jules Hye de Crom : *Cypripedium Tracyanum*.

C. J. Lucas, Esq. : *Cypripediums*.

Messrs. Davidson : rare Orchids.

Miss Helen F. M. Sidney : *Dendrobium Ainsworthii*.

Mr. L. Lawrence : *Selenipedium Sedeni candidulum*.

ORCHID COMMITTEE, MARCH 10, 1914.

Sir HARRY J. VEITCH in the Chair, and twenty members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Jas. Veitch, Chelsea, for a group of *Dendrobium Wardianum*, *Lycaste Skinneri*, and *Odontoglossums*.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

To Messrs. Sander, St. Albans, for hybrids and rare species.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for hybrids and *Dendrobiums*.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Odontoglossums*, *Odontiodas*, &c.

To Messrs. J. Cypher, Cheltenham, for a group.

Bronze Banksian Medal.

To Messrs. Flory & Black, Slough, for hybrids.

To Messrs. W. B. Hartland, Cork, for a group.

First-class Certificate.

To *Sophrocattleya* × *Wellesleyae* (*S. grandiflora* × *C. labiata*) (votes unanimous), from Lieut.-Col. Sir Geo. L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). A very beautiful hybrid. Flowers large for its class, scarlet, with a rich cerise-red glow. The inflorescence bore three flowers.

Award of Merit.

Laeliocattleya × 'Dulce' (*C. Mendelii* × *L. anceps Sanderiana*) (votes unanimous), from Messrs. Sander. Inflorescence one foot,

bearing at the top three flowers nearest to *C. Mendelii* in size and shape, white tinged with lilac, the front of the lip being purple.

Dendrobium × *Bassetii* (*Rolfeae* × *melanodiscus Salleri*) (votes, 13 for, 5 against), from Mrs. Haywood, Reigate. Flowers rose colour ; lip white, with rose tip.

Other Exhibits.

Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. : *Laeliocattleya* × 'Glaucus.'

The Earl of Craven : *Laeliocattleya* × *Corneliensis* (L.-c × *Haroldiana* × *C. Schröderae*).

R. G. Thwaites, Esq. : hybrids.

Pantia Ralli, Esq. : *Odontoglossums* and *Odontiodas*.

E. R. Ashton, Esq. : hybrids.

H. S. Goodson, Esq. : hybrids.

F. M. Ogilvie, Esq. : rare Orchids.

W. C. Clark, Esq. : *Laeliocattleya* × *luminosa*.

Messrs. Davidson : a group.

Messrs. McBean : a group.

Messrs. Hassall : a group.

Monsieur Mertens : *Odontoglossums*.

ORCHID COMMITTEE, MARCH 24, 1914.

Mr. J. GURNEY FOWLER in the Chair, and twenty-four members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Sander, St. Albans, for a group of *Cymbidiums* and hybrids.

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for hybrids, *Odontoglossums*, &c.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Odontoglossums* and *Laeliocattleyas*.

To Messrs. Stuart Low, Bush Hill Park, for *Dendrobiums* and other Orchids.

Silver Banksian Medal.

To Sir Jeremiah Colman, Bt., V.M.H., Gatton Park (gr. Mr. Collier), for a finely-flowered group of *Odontiodas*.

To Messrs. Cypher, Cheltenham, for *Dendrobiums*.

To Messrs. Flory & Black, Slough, for hybrids.

To Messrs. Hassall, Southgate, for a group.

First-class Certificate.

To *Odontioda* × 'Zenobia' (*Odontioda Charlesworthii* × *Odontoglossum percultum*) (votes unanimous), from F. M. Ogilvie, Esq., The

LXXIV PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Shrubbery, Oxford (gr. Mr. Balmforth). Flowers of fine form and substance; sepals and petals deep reddish claret, with a violet shade; lip rose, with yellow crest. (Fig. 41).

Award of Merit.

To *Dendrobium superbum Huttonii*, Southfield variety (votes, 20 for, 2 against), from W. Waters Butler, Esq., Southfield, Edgbaston (gr. Mr. Jones). A form of the variety to which a **F.C.C.** was given March 27, 1894. Flowers white, with violet lip with a broad white margin and apex.

To *Sophrolacliocattleya* × 'Niobe,' Orchid Dene variety (*L.-c.* × *Gottiana* × *S.-l.* × 'Felicia') (votes unanimous), from Messrs. E. H. Davidson, Twyford. Flower large, bright rose-purple, with deep claret-red lip.

Cultural Commendation.

To Mr. W. H. White, Orchid-grower to Elizabeth, Lady Lawrence, Burford, for *Platyclinis glumacea* with about 100 slender sprays of white flowers.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bt., Gatton Park, for *Odontioda Bradshawiae* with 119 flowers of bright scarlet colour.

Other Exhibits.

Pantia Ralli, Esq.: *Odontoglossum* × 'Aureole.'

E. R. Ashton, Esq.: *Miltonia vexillaria* 'Lyoth.'

W. Waters Butler, Esq.: *Cattleya* 'Tityus,' Southfield variety.

Sir John Edwards-Moss: *Laeliocattleya*.

R. G. Thwaites, Esq.: hybrids.

Messrs. McBean: *Odontiodas*.

ORCHID COMMITTEE, APRIL 7, 1914.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended:—

Silver Flora Medal.

To Mrs. Norman Cookson, Wylam (gr. Mr. H. J. Chapman), for *Odontiodas* and *Odontoglossums*.

To Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander), for hybrid Orchids.

To Messrs. Charlesworth, Haywards Heath, for hybrid *Odontoglossums* and *Laeliocattleyas*.

To Messrs. Stuart Low, Jarvisbrook, for *Dendrobiums* and hybrids.

To Messrs. Sander, St. Albans, for hybrids and species.

Silver Banksian Medal.

To R. G. Thwaites, Esq., Streatham, for hybrids.

To Messrs. Hassall, Southgate, for a group.

To Messrs. James Cypher, Cheltenham, for a group.

First-class Certificate.

To *Odontoglossum* × 'Mogul' (parentage unrecorded) (votes unanimous), from Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Flowers of fine form, white, two-thirds of each segment being filled by a large irregular blotch of claret-purple. (Fig. 42.)

To *Cattleya* × 'Tityus,' Shrubbery variety (× 'Enid' × 'Octave Doin') (votes unanimous), from F. M. Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). The plant which secured an A.M. March 18, 1913, greatly improved. Flowers large, petals and lip broad and crimped, white, with a pearl-pink tint. Front of lip crimson.

Award of Merit.

To *Laeliocattleya* × *amabilis* 'Fascinator' (*L.-c.* × 'Fascinator' *albens* × *C. Lüddemanniana Stanleyi*) (votes unanimous). Sepals and petals pure white. Lip deep claret-red, the base being tubular and the front expanded.

To *Odontioda* × *Graireana* (*O. Rossii* × *C. Noezliana*) (votes, 12 for, 2 against), from Monsieur H. Graire, Amiens. In habit resembling *O. Rossii*. Sepals and petals light rose, blotched with orange-red. Lip rose, with yellow crest.

Cultural Commendation.

To Mr. H. G. Alexander, Orchid-grower to Lieut.-Col. Sir Geo. L. Holford, K.C.V.O., for a fine specimen of *Laeliocattleya* × 'Tigris' (*L. Cowanii* × *L.-c.* × *Dominiana*) with two spikes of many bright yellow flowers.

Other Exhibits.

Sir Jeremiah Colman, Bt. : rare Orchids.

J. T. Bennett-Poë, Esq. : *Cymbidium Lowianum*, Holmwood variety, and *C. Lowianum*, Bennett-Poë's variety.

Pantia Ralli, Esq. : *Odontioda Vuylstekeae*.

F. Menteith Ogilvie, Esq. : plants of *Dendrobium Thwaitesii*, Veitch's variety.

Major Lister : *Gongora quinquenervis*.

Mrs. Ann Meade-King : *Schomburgkia Lüddemannii*.

Eustace F. Clark, Esq. : two hybrids.

ORCHID COMMITTEE, APRIL 15, 1914.

Mr. DE BARRI CRAWSHAY in the Chair, and seven members present.

Awards Recommended :—

Award of Merit.

To *Odontoglossum* × *eximium*, The Dell variety (*ardentissimum* × *crispum*) (votes unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flowers large, white tinged with purple, the inner parts of the segments deep claret-red.

To *Miltonia vexillaria* 'Lyoth' (*chelsiensis* × 'Memoria G. D. Owen') (votes unanimous), from Messrs. Charlesworth. One of a batch of home-raised seedlings. Flowers rose-pink, with a crimson mask at the base of the lip which is large and broadly ovate.

To *Odontioda* × 'Joan' (*Odontioda Charlesworthii* × *Odontoglossum ardentissimum*) (votes unanimous), from Messrs. Charlesworth. This retains the bright red colour of *O. Charlesworthii* on broader flowers, but none of the white and rose-purple colour of the other parent appears.

To *Odontoglossum* × 'Elissa' (*Edwardii* × *illustrissimum*) (votes, 6 for, 1 against), from Pantia Ralli, Esq., Ashted Park, Surrey. Flowers of the usual form of *O. Edwardii* crosses, rose-purple, with yellow crests to the lip.

Other Exhibits.

Lord Grantley : *Odontoglossum* 'Zena.'

De B. Crawshay, Esq. : *Odontoglossum Crawshayanum*.

G. Hamilton-Smith, Esq. : *Cymbidium glebelandense*.

Pantia Ralli, Esq. : *Odontoglossum Pescatorei virgineum*.

Messrs. Charlesworth : rare Orchids.

Messrs. Sander : *Calliandra Gravesiana*.

ORCHID COMMITTEE, APRIL 21, 1914.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended :—

Silver Flora Medal.

To F. M. Ogilvie, Esq., Oxford (gr. Mr. Balmforth), for *Odontiodas*.

To H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood), for a group.

To Messrs. Stuart Low, Jarvisbrook, for *Dendrobiums*, *Cattleyas*, &c.

To Messrs. McBean, Cooksbridge, for *Odontoglossums* &c.

Silver Banksian Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Odontoglossums* and *Laeliocattleyas*.

To Messrs. J. Cypher, Cheltenham, for *Dendrobiums* and hybrids.

To Messrs. Sander, St. Albans, for a group containing some rare species and new hybrids.

To R. G. Thwaites, Esq., Streatham, for hybrids.

To Messrs. Flory & Black, Slough, for a group.

Bronze Banksian Medal.

To Messrs. W. B. Hartland, Cork, for a small collection.

First-class Certificate.

Odontoglossum × 'Mirabeau' var. 'Mastiff' (*Mirum* × *Lambeauianum*) (votes, 16 for, 1 against), from Messrs. McBean. Flower over 4 inches across, deep claret-purple, with white margins and a few white lines on the segments.



FIG. 40.—CYMBIDIUM × ALEXANDERI, HAMILTON-SMITH'S VARIETY (*Gardeners' Chronicle*),
(p. 1xvi.)

(To face p. 1xxvi)



FIG. 41.—*ODONTIODA* 'ZENOBIA' (p. lxviii).

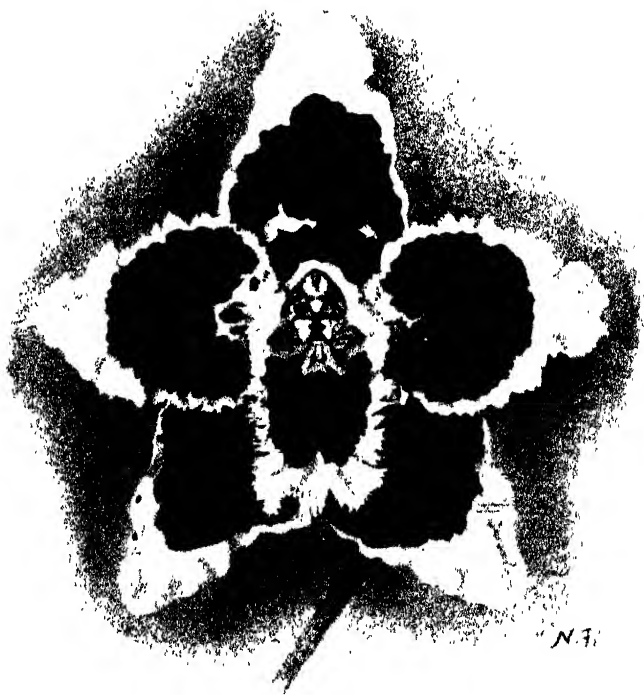


FIG. 42 —*ODONTOGLOSSUM* x 'MOGUL' (p. lxxv).

Award of Merit.

Oncidioda × *Cooksoniae* ('Grenadier') (*C. Noezliana* × *O. macranthum hastiferum*) (votes, 12 for, 3 against), from Pantia Ralli, Esq., Ashted Park. The darkest of the four which have received awards. Colour dark scarlet-red.

Cultural Commendation.

To Mr. Balmforth (gr. to F. M. Ogilvie, Esq.), for *Odontioda* × 'Mrs. Ogilvie' with sixty flowers.

To Mr. Balmforth, for *Odontioda* × 'Diana' with several spikes, bearing together 177 blooms.

To Messrs. Sander, for a very large specimen of *Phaius Sanderianus*.

To Messrs. Armstrong & Brown, for *Coelogyne pandurata*, Orchid-hurst variety, with a 3 ft. spike of 13 flowers, each 6 inches across.

Other Exhibits.

Licut.-Col. Sir Geo. L. Holford, K.C.V.O. : *Sophtrocattleyas*.

Sir Jeremiah Colman, Bt. : rare Orchids.

De B. Crawshay, Esq. : hybrid *Odontoglossums*.

Messrs. Hassall : *Cattleya Dusseldorfei* 'Undine.'

C. Kirch, Esq., Hornsey : *Coelogyne pandurata*.

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ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

Shows open One Hour later.

- | | |
|--|--|
| 1. General. | 19. Trials at Wisley. |
| 2. Letters. | 20. Trial of Seedling Dahlias. |
| 3. Telephone and Telegrams. | 21. Dahlia Prizes. |
| 4. Journals Wanted. | 22. Saxifrage Conference, 1915. |
| 5. Subscriptions. | 23. Fruit Packing Competitions. |
| 6. Form of Bequest. | 24. National Diploma in Horticulture. |
| 7. Privileges of Chemical Analysis. | 25. Examinations, 1915. |
| 8. List of Fellows. | 26. Information. |
| 9. New Fellows. | 27. Inspection of Fellows' Gardens. |
| 10. An Appeal. | 28. Affiliation of Local Societies. |
| 11. R.H.S. Gardeners' Diary. | 29. Affiliated Societies' Certificate Cards. |
| 12. Lindley Library. | 30. Rules for Judging—1914 Code. |
| 13. The Society's Gardens at Wisley. | 31. Rules for Judging Cottage and Allotment Gardens. |
| 14. Rock Garden at Wisley. | 32. R.H.S. Daffodil Year Book. |
| 15. Students at Wisley. | 33. Disbudding of Orchids. |
| 16. Distribution of Surplus Plants. | 34. Disbudding Chrysanthemums. |
| 17. Exhibitions, Meetings, and Lectures in 1914. | 35. Advertisements. |
| 18. Forced Bulb Show. | |

SHOWS OPEN ONE HOUR LATER.

A communication having been received from Fellows in the City, asking that the Shows at Vincent Square might remain open one hour longer, the Council, after consulting the most frequent Exhibitors, decided to adopt the suggestion. Fellows will accordingly find the later hours set forth in their Annual Tickets.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report

of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence. .

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number : **VICTORIA 5363.**

"HORTENSIA SOWEST LONDON" is sufficient address for telegrams. This address counts as two words only.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of any numbers of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted :—

Vol. IV. Part 14.

Vol. XIV.

Vol. V. Part 1.

Vol. XV. Parts 2 and 3.

Vol. X.

Vol. XXXVIII. Part 3.

Vol. XIII. Part 1.

These are, therefore, particularly asked for.

5. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, shall pay the annual subscription for the current year ; if elected after the 1st of July and before the 1st of October, he shall pay half a year's subscription ; if elected after the 1st of October and before the 1st of January, he shall pay at the time of his election the full amount of his subscription for the year commencing from the 1st day of January then next, and no further subscription until the next succeeding 1st of January. To avoid the inconvenience of remembering their subscriptions Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments ; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched within the first month of the year. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are

debarred from all the privileges of the Society ; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £.....; to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease ; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at page 117 in the "Book of Arrangements," 1914.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL and the "Book of Arrangements."

9. NEW FELLOWS.

The rapidly increasing number of Fellows is an important indication of the useful work the Society is doing, and of its value to all lovers of the Garden. The President and Council hope that existing Fellows will continue to enlist the sympathy of their friends.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by a small proportion of the Fellows ; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by :—

1. Increasing the Number of Fellows.
2. Helping to swell the Fund for providing Prizes for the Students at Wisley.
3. Providing Lectures with Lantern Slides.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

4. Presenting Books to fill the gaps in the Library both at Vincent Square and at Wisley.

5. Sending new or rare Plants and Seeds for the Garden and surplus Roots for distribution to the Fellows.

6. Sending Plants for the *New Rock Garden* at Wisley.

Thus there is plenty for all to do according to their individual liking : personal effort, money, plants, books, are all alike needed. The Secretary asks for help in the ways above indicated. Since the issue of the last JOURNAL two framed plates of fruits in colour, dated 1732, have been received from Mr. T. J. Salwey ; books and dried plants from Miss E. M. C. Kaye ; a collection of Moths and Beetles from Mr. W. D. Drury, and a number of Hybrid Cacti from Mr. R. Baillie MacBean.

11. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1915 contains a considerable quantity of new information, and is compiled more especially for the single-handed gardener. It will be published in November, price 1s. 1d., post free, from the R.H.S. Office, Vincent Square, London, S.W. 1 or 2s. 1d. if leather-bound.

12. LINDLEY LIBRARY.

The Society, acting in and through its Council, having now become sole trustee of the Lindley Library, Fellows and friends of the R.H.S. have the encouragement of knowing that their gifts to the Library can never be lost to the Society, but are attached to it in perpetuity. It should now be the aim of all to make the Library far more perfect and complete than it is at present. Gifts of books, old or new, will be gratefully accepted.

13. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the last Annual Meeting for the further development of the practical and scientific work at the Wisley Gardens, Fellows will be pleased to know that the Council have been fortunate in securing the services of Dr. Frederick Keeble, F.R.S., as Director. He took up his duties at the beginning of July. Other appointments are being carefully considered with a view of securing a thoroughly competent staff to make Wisley the foremost horticultural institution of its kind in the British Empire. All communications to the Gardens should in future be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

Mr. F. J. Chittenden, F.L.S., who has done such splendid work in the Laboratory and with the Students since 1907, will still continue in this capacity under the re-organization scheme, and Mr. Wright will similarly continue his work in the Garden.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each

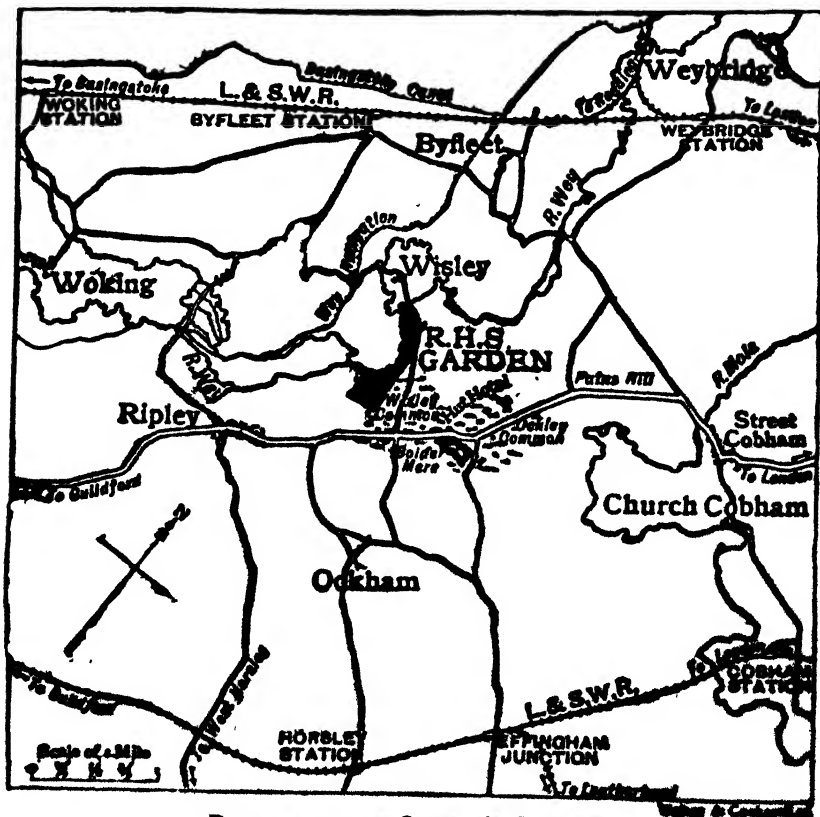
Fellow's Ticket admits three to the Gardens. The Public are not admitted.

The Gardens are about $3\frac{1}{2}$ miles from Byfleet, $3\frac{1}{2}$ miles from Horsley, and $5\frac{1}{2}$ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8s.; or waiting three hours, 10s.; or to and from Horsley, 7s.; Effingham Junction, 7s.; Byfleet, 7s. Motor cars will be found at Byfleet Station. Visitors should in all cases be careful to state the trains they intend to arrive by and leave by. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy at Ockham.

The motor route from London to Wisley will be found in the "Book of Arrangements," p. 157.

14. ROCK GARDEN AT WISLEY.

In consequence of the rapidly increasing interest taken in what are popularly called "Alpine Plants," "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat



POSITION OF THE SOCIETY'S GARDENS.

extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that. The construction of the Rock Garden is completed, and the planting is proceeding, but it will be at least two years or more before the plants on it can be seen at their best.

An Alpine House has been built above the Rock Garden, chiefly for the purpose of growing rock plants to perfection which blossom too early to withstand our wet winters and late spring frosts. In this House Fellows may see such plants in flower from February onwards.

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15. STUDENTS AT WISLEY.

N.B.—There will be a few vacancies for the two years' Course commencing in September 1914. Early application should be made to the Secretary.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Horticulture, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

16. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot ; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries ; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

17. EXHIBITIONS, MEETINGS, AND LECTURES IN 1914.

The programme will be found in the "Book of Arrangements" for 1914. An Exhibition and Meeting is held practically every fortnight throughout the year, and a short lecture on some subject connected with Horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any

Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (34) of halfpenny cards *ready addressed* to himself.

January	13, 27.
February	10 (Annual Meeting), 24.
March	10-11 (Forced Bulbs), 24.
April	7, 15-16 (Daffodils), 21, 23 (Spring Roses).
May	5, 19-21 (Chelsea), 25-29 (Rhododendrons).
June	3, 4 (Hardy Plants), 16, 30 (Holland House).
July	1-2 (Holland House), 14, 16 (Sweet Peas), 17 (Carnations), 28.
August]	11, 25.
September	8 (Dahlias), 22 (Vegetables), 24 (Autumn Roses), 29-30 (Fruit Show).
October	6, 20.
November	3, 17.
December	1, 2 (Winter-flowering Carnations), 15.

18. SPRING SHOW OF FORCED BULBS.

TUESDAY AND WEDNESDAY, MARCH 9 AND 10, 1915.

A Special Spring Exhibition of Forced Bulbs will be held on these days, the object being to demonstrate the varieties best suited for gentle forcing. Exhibits of small and large collections are invited from Amateurs and the Trade. R.H.S. Medals will be awarded according to merit.

The Council of the Royal Horticultural Society also offer (subject to the General Rules of the Society) the following Prizes presented to them by the General Bulb Growers' Society of Haarlem:—

Division I.—For Amateurs.

Class 3.—Eighteen Hyacinths, distinct.

1st Prize	.	.	.	Gold Medal and £3 3s.
2nd	"	.	.	Silver-gilt Medal and £2 2s.
3rd	"	.	.	Silver Medal and £1 1s.

Class 4.—Twelve Hyacinths, distinct.

1st Prize	.	.	.	Silver-gilt Medal and £2 2s.
2nd	"	.	.	Silver Medal and £1 1s.
3rd	"	.	.	Bronze Medal and 10s.

Class 5.—Six Hyacinths, distinct.

1st Prize	.	.	.	Silver Medal and £1 1s.
2nd	"	.	.	Bronze Medal and 10s.

Class 6.—Eight pans containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different

colour from those of the other seven pans ; the bulbs need not have been actually grown in the pans.

1st Prize	.	.	.	Gold Medal and £3 3s.
2nd	„	.	.	Silver-gilt Medal and £2 2s.
3rd	„	.	.	Silver Medal and £1 1s.

Class 7.—Four pans containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other three pans ; the bulbs need not have been actually grown in the pans.

1st Prize	.	.	.	Silver-gilt Medal and £2 2s.
2nd	„	.	.	Silver Medal and £1 1s.
3rd	„	.	.	Bronze Medal and 10s.

Class 8.—The finest decorative display of Hyacinths, to be staged on the floor.

1st Prize	.	.	.	Gold Medal and £3 3s.
2nd	„	.	.	Silver-gilt Medal and £2 2s.
3rd	„	.	.	Silver Medal and £1 1s.

Division II.—For Trade Growers.

Class 9.—The finest decorative display of Hyacinths, to be staged on the floor.

Special Prize, Silver Cup of the General Bulb Growers' Society of Haarlem, Holland.

1st Prize	.	.	.	Gold Medal.
2nd	„	.	.	Silver-gilt Medal.
3rd	„	.	.	Silver Medal.

Regulations.—For Classes 3, 4, and 5 each bulb must be in a separate pot (size optional). Classes 3, 4, 5, 6, and 7 must be all single spikes ; no spikes may be tied together. Exhibitors may only compete in one of the Classes 3, 4, or 5, and in either 6 or 7. All bulbs must have been forced entirely in Great Britain or Ireland. All varieties should be correctly named. Points will be deducted for all incorrect names.

19. TRIALS AT WISLEY, 1914-15.

N.B.—Everything sent for trial *must be named*, and the name and address of the sender attached, together with the name of the raiser and introducer as far as known.

TRIAL OF TULIPS, AND ARRANGEMENT OF NOMENCLATURE.

In the autumn of 1913 an invitation was issued to the leading growers to send to Wisley for trial bulbs of their varieties of Tulips, with the names under which they respectively knew them. These were planted at Wisley, and on Monday, April 20, a joint committee

of Dutch and English experts met to consider the early varieties ; and again on May 6 and 7 to consider the May-flowering varieties.

Over 4000 were examined, and their nomenclature and synonyms determined.

The trials of the May-flowering varieties only will be continued in 1915, and growers are invited to send fresh bulbs—five of each variety—named. Bulbs will not be accepted later than November 1, 1914. Senders are asked to designate their colour and the class to which they belong, to facilitate the work of planting.

If sent by post : The Director, R.H.S. Gardens, Wisley, Ripley, Surrey.

If by rail : The Director, R.H.S. Gardens, Wisley, Horsley Station, L. & S.W.R., with advice by post to the Director.

The Committee drew up recommendations for a classification. These will be reconsidered at a Conference to be held at Vincent Square on May 13 and 14, 1915, when it is intended to prepare the final list of varieties and synonyms and all recommended varieties will be placed in one or other of the sections and sub-sections of the classification.

This final list, with official descriptions, will be printed and published by, and at the expense of, the R.H.S. in conjunction with the Dutch Bulb Growers' Society in Haarlem.

To make the descriptions short and clear, certain typical varieties will be selected, described, figured, and named, so that others can be described by reference to them. Thus systematised, the colour, shape, base, and the relative length and breadth of the inner segments will be recorded.

TULIP SHOW.

The Council have adopted the recommendation of the Committee to hold a Show of Darwin and Cottage Tulips on May 14, 1915, for cut blooms only, in vases, for the purpose of enabling the Nomenclature Committee to decide on the synonyms of the varieties sent, for which the following arrangements have been made :—

1. R.H.S. Medals will be given to collections and Awards made to species and varieties at the discretion of the Council.

2. On May 12.—The Hall will be available for staging from mid-day. On May 13.—Staging must be completed by 9 A.M. when the Committee will commence their work. The Committee *only* will be allowed in the Hall on the 13th. On May 14, at 9 A.M.—Committee will continue their work. At 11 A.M., two members of each exhibiting firm and private exhibitors will be admitted, but not earlier. At 1 P.M., R.H.S. Fellows will be admitted. At 2 P.M., the public will be admitted.

3. A full collection of standard varieties of May flowering varieties will be brought from Holland for comparison.

4. All British growers are invited to send blooms.

TRIAL OF HORTICULTURAL SUNDRIES.

The Council will continue their Trial of Sundries in 1915, and Sundriesmen are again invited to send their specialities (not more than three articles in any one year). Full particulars, with Entry Form, can be obtained from the Secretary, R.H.S., Vincent Square, S.W., upon receipt of a stamped addressed envelope.

20. SEEDLING DAHLIAS.

The Society's trial of Dahlias, from a garden decorative point of view, carried out in the gardens of Reginald Cory, Esq., at Duffryn, has proved a genuine success, and in consideration of this, and desiring to encourage raisers still further to devote particular attention to producing varieties well adapted to garden decoration, Mr. Cory felt the desirability of holding a further trial this year, and, after putting his views before the Council of the Society and the National Dahlia Society, and being assured of their willingness to co-operate as they did last year, it has been decided to hold a trial in 1914 of seedlings not in commerce and any varieties offered for the first time in 1914.

These will be grown, judged, and reported on in exactly the same way, and as far as possible by the same individuals, as in 1913. Mr. Cory kindly offers the Council a £5 5s. Cup to be awarded to the most meritorious plant, and the Council will give any other awards they think fit.

21. DAHLIA PRIZES AT THE R.H.S. MEETING ON SEPTEMBER 8, 1914.

The object of this competition is not so much to attract the finest cut blooms as seen on the Show stand, for such flowers may, when growing on the plant, be almost invisible, and no contribution to the decoration of the Garden, whatever they may be for cutting. The object is to discover the most Decorative Garden Dahlias—that is, those varieties which add most to the beauty of the Garden, for, as is well known, not a few of the most glorious Dahlia flowers add nothing to the aspect of the Garden as they are hidden beneath the foliage. They may be excellent to grow in the Kitchen Garden to cut for house decoration, but they are useless for the ornamentation of the Pleasure Garden. (See paragraph 20.) So-called Show Dahlias *may* also be Decorative and therefore eligible.

SCHEDULE.

Only flowers of those varieties which received commendation in the 1912 trials at Duffryn should be shown unless they be new varieties not yet in commerce. Any others, no matter how attractive as cut

flowers, will cause the exhibitor to lose points. A list of commended varieties can be obtained from the R.H.S. Offices.

Class A.—Amateurs.—A group of Decorative Garden Dahlias of all or any sections. Twelve feet run of 3 feet tabling, not to be built up more than 8 feet in height from the ground level.

First Prize : R.H.S. Silver Cup.

The Council may make other awards according to merit.

Class B.—Open.—A group of Decorative Garden Dahlias of all or any sections. Twenty-five feet run of 3 feet tabling, not to be built up more than 8 feet in height from the ground level.

First Prize : Seventy-five Guinea Challenge Cup, presented to the R.H.S. by Reginald Cory, Esq.

The Council will make other awards according to merit.

In both Classes all the stems must touch the water, and no wiring or artificial support will be allowed. Hardy foliage or grasses may be employed for decoration.

The winner will hold the Cory Cup for one year, subject to a sufficient insurance against loss, and to a guarantee to return it in good condition, or, failing this, to refund to the R.H.S. the sum of eighty guineas. On the return of the Cup the Council will present the holder with a smaller commemorative Silver Cup.

The same exhibitor may win the Cup only once in three years, but should the winner of the previous year be again considered first the Council will bestow a special award.

The decision of the Council is final, and the Cup may be altogether withheld at their discretion.

The Council will not award this high distinction unless satisfied and assured that the exhibit is, in the main, due to the work and capability of the exhibitor or his employes, and on this point the Council may consult any expert not competing for the Cup.

The attention of intending exhibitors is particularly directed to the Society's 1914 Code of "Rules for Judging."

22. SAXIFRAGE CONFERENCE, 1915.

It has been decided to hold a Conference on Saxifrages on April 28, 1915. The Secretary would be glad to hear from any who would like to contribute a paper or otherwise take a part in the Conference.

23. FRUIT PACKING COMPETITIONS.

The following Class appears in the Schedule for the Autumn Fruit Show on September 29 :—

Soft Fruit packed in an attractive manner and so as to travel unbruised either by rail or post. The package must be sent by parcel

post from the Exhibitor's nearest Post Office, or be handed in at his nearest or most generally used Railway Station, and delivered (by the officials of the Railway or Post Office) at Vincent Square, either on the day previous to, or before 10.30 A.M. on the morning of, the Show. In no circumstances may a competitor bring the package or send it by hand, or otherwise convey it farther than his nearest or most usual Post Office or Railway Station. If sent by rail, a post-card addressed to the Secretary, R.H.S. Office, Vincent Square, Westminster, must be sent at once, saying from what station, and at what time, the parcel was despatched. Separate packages, or punnets, may be used inside the parcel if desired, but the whole package must not exceed 18 inches in length, 10 inches in breadth, and 5 inches in depth—all inside measurements. The packages may be of any material so long as they are sufficiently strong, but not too heavy.

The Council's desire is to obtain a really good and useful lesson in the packing of *soft* fruits so as to enable them to be sent by post or by passenger train, and to arrive in a condition suitable for a gentleman's table. The Council will give special awards to exhibits which are in accordance with the above conditions.

Market growers may compete as well as private gardeners.

"Soft Fruit" includes such as ripe strawberries, cherries, figs, peaches, and nectarines, and not such as apples, pears, and melons, or unripe plums. Tomatos are excluded.

24. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners will welcome the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations which will be required. The Diploma will be thoroughly "National," for by the consent of H.M. Government the Department of Agriculture, after being approached in the matter, consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized that the Diploma should bear the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations will be practical, viva voce, and written. The practical part will be held in suitable gardens at convenient centres in the country. The first Diploma Examination was held in June 1914, and will hereafter be held annually.

Among those for whose benefit the Diploma is established are the following:—Florists, Fruit Growers, Gardeners, Horticultural Inspectors, Horticultural Instructors (not School Teachers giving instruction in other subjects), Landscape Gardeners, Market Gardeners, Nurserymen, Public Park Gardeners, and Seedsmen.

Fuller information may be obtained from the Secretary, Royal Horticultural Society, Vincent Square, S.W.

25. EXAMINATIONS, 1915.

1. The Annual Examination in the Principles and Practice of Horticulture will be held on March 31, 1915. The Examination has two divisions, viz. (a) for Candidates of eighteen years of age and over, and (b) for Juniors *under* eighteen years. Particulars for 1915 may be obtained by sending a stamped and directed envelope to the Society's offices. Copies of the Questions set from 1893 to 1914 (price 2s. post free) may also be obtained from the office. The Society is willing to hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

The Examination will not be held outside the British Isles until further notice.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Royal Horticultural Society, to be awarded after the 1915 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 14, 1915. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The conduct of this Examination is on similar lines to that of the general Examination. Questions on Elementary Chemistry and Biology are included.

Medals and Certificates are awarded and Class Lists published in connexion with these Examinations.

26. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at

27. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3s. for one day (or £5 5s. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the *owner*.

28. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 330 Societies have joined our ranks, and the number is steadily increasing.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3s. 6d. for 10 copies, 5s. 6d. for 20, 11s. 6d. for 50, 20s. for 100. (See next paragraph.)

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5s. 6d., with case complete; Silver, 12s. 6d., with case complete; Silver-gilt, 16s. 6d., with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6d. each.

29. AFFILIATED SOCIETIES' CERTIFICATE CARDS.

At the request of several of the Affiliated Societies, the Council have had the Certificate Card (issued some years ago for the use of Affiliated Societies) beautifully coloured. The uncoloured Card will still continue to be issued at the old prices, and the new coloured Card at 8d. a single copy, or 10 for 5s., post free.

30. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised, and the new edition is now ready. It contains a useful Index and several important amendments. Special attention is drawn to new "Rules for Judging Cottage and Allotment Gardens," with the companion "Judges' Point Sheet" (see paragraph below), and a "Classification of Stove, Greenhouse, and Hardy Plants for Show Purposes." The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1s. 6d., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster. S.W.

31. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at twopence a copy, or fifty for 7s. 6d.

A companion Judges' Sheet in a very convenient book-like form can also be had for 2s. a dozen. This Judges' Sheet has, in tabulated form, a list of the subjects usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given.

32. R.H.S. DAFFODIL YEAR BOOK.

The Council have consented to publish on August 1 a "Daffodil Year Book." It will contain the most up-to-date information regarding new varieties of Daffodils; the Awards made at the 1914 Daffodil Shows in London, Birmingham, and elsewhere; special articles, illustrative plates, and the Schedule for the 1915 R.H.S. Daffodil Show. The Year Book for 1913 is already sold out, so that all who are interested in these beautiful Spring flowers are advised to order a copy of 1914 at once from the Society's Office, Vincent Square, London, S.W. Price 2s. 6d. post free.

33. DISBUDDING OF ORCHIDS.

At the request of the Orchid Committee the Council have made a rule that "Awards will not be given to any Orchids of which the natural size and character of the flowers have, in the opinion of the Orchid Committee, been in any way changed or improved through the removal of a bud or buds, or part of the spike."

34. DISBUDDING CHRYSANTHEMUMS.

When single-flowered Chrysanthemum plants are submitted for certificate one plant must be shown without any disbudding whatsoever, and one plant somewhat disbudded, in order that the quality of the blooms on the undisbudded stems may be compared with those on the disbudded stems.

35. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

STATEMENT OF CHEMICAL PRIVILEGES OF FELLOWS.

SUGGESTIONS AS TO THE PURCHASE OF ARTIFICIAL MANURES, ETC. AND INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES FOR ANALYSIS.

CHEMICAL ANALYSIS.

Applicable only to the case of those Fellows who are not engaged in any Horticultural Trade, or in the manufacture or sale of any substance sent for Analysis.

The Council have fixed the following rates of Charges for Chemical Analysis to Fellows of the Society being *bond fide* Gardeners or Amateurs.

These privileges are applicable only when the Analyses are for *bond fide* horticultural purposes, and are required by Fellows for their own use and guidance in respect of gardens or orchards in their own occupation.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Fellow applying for them, and must not be used for the information of other persons, or for commercial purposes.

Gardeners when forwarding samples are required to state the name of the Fellow on whose behalf they apply.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

When applying for an analysis, Fellows must be very particular to quote the number in the following schedule under which they wish it to be made :—

No.		
1.—	An opinion on the purity of bone-dust (each sample)	2s. 6d.
2.—	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5s.
3.—	An analysis of guano, showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10s.
4.—	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5s.
5.—	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime and ammonia, together with an opinion as to whether it be worth the price charged	10s.
6.—	An analysis of bone-dust, basic slag, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10s.
7.—	Determination of potash in potash salts, compound manures, &c.	7s. 6d.
8.—	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10s. to £1
9.—	An analysis of limestone, showing the proportion of lime	7s. 6d.
10.—	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	£1
11.—	Complete analysis of a soil	£2
12.—	Analysis of any vegetable product	10s.
13.—	Determination of the "hardness" of a sample of water before and after boiling	5s.
14.—	Analysis of water used for domestic purposes	£1 10s.
15.—	Consultation by letter	5s.

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. AUGUSTUS VOELKER, M.A., F.I.C., 1 Tudor Street, New Bridge Street, London, E.C.

☞ The fees for analyses must be sent to the Consulting Chemist at the time of application.

EXTRACTS FROM THE PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

MAY 5, 1914.

Prof. F. KEEBLE, F.R.S., Sc.D., in the Chair.

Fellows elected (74).—G. I. Adams, Mrs. E. Anderson, Mrs. Armfield, Mrs. P. Ashworth, S. B. V. Asser, G. F. Bell, Mrs. H. P. Bell, J. J. Bolton, C. H. Buck, Mrs. A. D. H. Cameron, Mrs. R. Campbell, Mrs. Clark, F. Coates, Lady Georgina Corser, A. R. Crossley, W. L. Crowley, Mrs. C. Cuthbertson, Mrs. St. G. Daly, Mrs. H. F. Dickson, Miss Dunlop, Mrs. Edmonstone, Miss H. M. Feilden, Mrs. A. Finlay, T. J. Finnie, A. G. Gentle, Miss E. Greg, Mrs. Hankey, W. H. Harper, Mrs. K. P. Hawksley, W. L. Hodgkinson, Mrs. G. I. Holmes, Mrs. J. I. Hopper, Mrs. Hopton, Mrs. R. A. Horlick, B. Howell, Mrs. B. C. Hughes, H. J. Jeaffreson, Miss L. Kearne, Mrs. K. Leather, Mrs. V. R. Le Maistre, C. E. Lewis, Mrs. Leyland, A. Lindley, Mrs. E. M. Lloyd, Lady Lugard, Mrs. MacDonald, Mrs. A. Mackinnon, T. C. Macnaghten, Mrs. Madocks, Miss K. Mansel, H. M. Mansell, W. J. Marshall, F. W. Mason, W. J. Mirrlees, Miss M. E. Palmer, F. E. Piesse, G. B. Punnett, R. R. Ramsey, P. Sale, Mrs. Scott-Nicholson, J. N. W. Sidebotham, J. H. Skewes, F. H. Smith, Mrs. Tarleton, Mrs. H. Tate, C. Tiller, Mrs. H. M. Townshend, Miss Tranter, Maj.-Gen. Tulloch, C.B., W. J. Turner, Mrs. W. Tyser, Mrs. P. R. Waud, R. H. Wilkinson, R. C. Wren.

Fellows resident abroad (3).—Mrs. Blandy (Madeira), D. Lumsden (U.S.A.), J. H. Melady (Canada).

Associates (2).—Miss S. Fry, C. Harris.

Society affiliated (1).—Upper Rhondda Conservative Hort. Soc.

A lecture on "Chinese Trees and Shrubs" was given by Mr. W. J. Bean (see p. 215).

CHELSEA SHOW.

MAY 19, 20, AND 21, 1914.

LIST OF JUDGES.

ORCHIDS.

Amateurs' Exhibits.

Bolton, W.
Cypher, J. J., V.M.H.
Sander, F., F.L.S., V.M.H.
Charlesworth, J.

Nurserymen's Exhibits.

Fowler, J. Gurney
Shill, J. E.
Moore, Sir F. W., M.A., F.L.S.,
V.M.H.
Crawshay, de Barri

ROSES.

Jennings, John
Orpen, O. G.
Page-Roberts, Rev. F.

CARNATIONS.

Barnes, N. F.
Blick, C.
Turner, Arthur

TULIPS.

Hall, A. D., M.A., F.R.S.
Jacob, Rev. J.
Ware, W. T.
Krelage, E. H.
de Graaff, Jan

BEGONIAS.

MacLeod, J. F.
Chapman, A.

FRUIT AND VEGETABLES.

Challis, T., V.M.H.
Bunyard, G., V.M.H.
Poupart, W.
Rollit, Sir Albert K., LL.D.,
D.C.L.

GROUPS IN THE OPEN AIR.

*(Excluding Rock and Formal
Gardens.)*

Crump, W., V.M.H.
Thomson, D. W.
Knowles, P. O.

ROCK AND ALPINE.

Outside and Inside.

Bowles, E. A., M.A.
Binley, W. A., J.P.
Clutton Brock, A.
Grandfield, J.

FORMAL GARDENS.

White, Edward
Williams, P. D.

HARDY HERBACEOUS.

In the Great Tent.

Dorrien-Smith, Captain A. A.,
D.S.O.
Cheal, Joseph
Beckett, E., V.M.H.
Lynch, R. Irwin, V.M.H.
Cuthbertson, W.
Crisp, Bernard

Table Exhibits.

Veitch, P. C. M.
Notcutt, R. C.
Davis, J.
Turner, T. W.
Fielder, C. R., V.M.H.
Pearson, A. H., V.M.H.

SWEET PEAS.

Stevenson, Thomas
Jones, H. J.
Watkins, Alfred

FOLIAGE PLANTS.

Bain, W.
Hudson, J., V.M.H.
Baker, W. G.

OTHER FLOWERING PLANTS.

In Great Tent.

Dixon, C.
Howe, W.
Reynolds, G.

In Table Tent.

Boscawen, Rev. A. T.
 Paul, G., V.M.H.
 Hales, W.

HORTICULTURAL SUNDRIES.

To Stands of Exhibits.

Hooper, H.
 Gordon, Geo. V.M.H.
 Boscawen, Hon. John

" DAILY GRAPHIC " CUP.

Bowles, E. A., M.A., F.L.S.
 Crisp, Sir Frank, F.L.S.
 Parsons, Alfred, R.A.

To Individual Objects.

Chittenden, F. J., F.L.S.
 Wilks, Rev. W., V.M.H.
 White, Edward

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH THE
 JUDGES.

The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Floral and Orchid Committees will be found in their respective reports.

ORCHIDS.

Gold Medal.

Sir Jeremiah Colman, Bart., V.M.H., Gatton, Reigate (gr. J. Collier).

Messrs. Charlesworth, Haywards Heath.

Messrs. Sander, St. Albans.

Silver-gilt Cup.

The Duke of Marlborough, K.G., P.C., Blenheim Palace, Woodstock (gr. G. Hunter).

Messrs. Armstrong & Brown, Tunbridge Wells.

Messrs. J. Cypher, Cheltenham.

Large Silver Cup.

Messrs. Mansell & Hatcher, Rawdon, Yorks.

Silver Cup.

Messrs. Stuart Low, Bush Hill Park, N.

Standard Cup.

J. Horlick, Esq., West Dean Park, Chichester (gr. W. H. Smith).

Messrs. McBean, Cooksbridge, Sussex.

The Davidson Silver Cup.

Messrs. Sander, St. Albans, for *Cattleya Schröderae* var. 'Queen Empress.'

Silver Flora Medal.

Mr. H. Dixon, Wandsworth, S.W.

Messrs. Flory & Black, Slough.

Silver Banksian Medal.

Mr. C. F. Waters, Balcombe, Sussex.

EXHIBITS IN THE OPEN AIR.

Gold Medal.

Mr. L. R. Russell, Richmond, S.W., for trees and shrubs.

Silver-gilt Cup.

Messrs. Kent & Brydon, Darlington, for rock garden.

Messrs. R. Wallace, Colchester, for rock garden.

Messrs. R. Wallace, Colchester, for formal garden.

Mr. J. Wood, Boston Spa, Leeds, for rock garden.

Large Silver Cup.

Messrs. W. Fromow, Chiswick, W., for Japanese Maples.

Messrs. J. Carter, Raynes Park, S.W., for formal garden.

Silver Cup.

Mr. Clarence Elliott, Stevenage, for rock garden.

Messrs. Pulham, 71 Newman Street, W., for formal garden.

Standard Cup.

Messrs. W. Cutbush, Highgate, N., for clipped trees.

Messrs. J. Piper, Bayswater, W., for formal garden.

Mr. M. Prichard, Christchurch, Hants, for rock garden.

The "Daily Graphic" Cup.

Mr. J. Wood, Boston Spa, Leeds, for rock garden.

Silver-gilt Flora Medal.

Messrs. Barr, Covent Garden, W.C., for rock garden.

Mr. T. H. Gaunt, Farsley, Leeds, for rock garden.

Mr. J. Klinkert, Richmond, Surrey, for trained trees.

Mr. R. C. Notcutt, Woodbridge, for an Azalea garden.

The Donard Nursery Co., Newcastle, Co. Down, for flowering trees.

Silver-gilt Banksian Medal.

Messrs. J. Piper, Bayswater, W., for topiary work.

Messrs. R. Tucker, Oxford, for rock garden.

Messrs. J. Waterer, Sons, & Crisp, Bagshot, for rock garden.

Silver Flora Medal.

Messrs. Bakers, Codsall, Staffs., for rock garden.

Messrs. J. Cheal, Crawley, for formal garden.

The Guildford Hardy Plant Nursery, for rock garden.

Mr. Amos Perry, Bush Hill Park, N., for Ferns.

Messrs. J. Piper, Bayswater, W., for rock garden.

Messrs. Pulham, 71 Newman Street, W., for rock garden.

Messrs. T. S. Ware, Feltham, for rock garden.

Messrs. Whitelegge & Page, Chislehurst, for rock garden.

Silver Knightian Medal.

Messrs. Geo. Bunyard, Maidstone, for fruit trees and Strawberries.

Silver Banksian Medal.

The Misses Hopkins, Shepperton, for rock garden.

Mr. G. Reuthe, Keston, Kent, for rock garden.

Bronze Banksian Medal.

Mr. C. Chantler, St. Mary Cray, for flowering trees and shrubs.

Messrs. Laxton, Bedford, for trained fruit trees.

Messrs. Wills & Segar, South Kensington, for Bay trees.

EXHIBITS IN THE GREAT TENT.

Gold Medal.

Messrs. Barr, Covent Garden, W.C., for Tulips.

Messrs. Blackmore & Langdon, Twerton, for Begonias.

Messrs. W. Cutbush, Highgate, for Roses.

Messrs. H. B. May, Upper Edmonton, for Ferns.

Messrs. Sutton, Reading, for florists' flowers.

Messrs. J. Veitch, Chelsea, for stove plants and Azaleas.

Messrs. R. Wallace, Colchester, for Lilies and herbaceous flowers.

Messrs. E. Webb, Stourbridge, for flowering plants.

Silver-gilt Cup.

Mr. C. Engelmann, Saffron Walden, for Carnations.

Mr. G. Mount, Canterbury, for Roses.

Messrs. W. Paul, Waltham Cross, for Roses.

Messrs. J. Piper, Bayswater, W., for Wistarias and Azaleas.

Large Silver Cup.

Messrs. G. Bunyard, Maidstone, for Rhododendrons.

Messrs. J. Carter, Raynes Park, S.W., for flowering plants.

Messrs. Cuthbert, Southgate, N., for flowering plants.

Messrs. G. Jackman, Woking, for Clematis.

Messrs. Waterer, Sons, & Crisp, Bagshot, for Rhododendrons.

Silver Cup.

Messrs. W. Cutbush, Highgate, for hardy plants.

Messrs. Dobbie, Edinburgh, for Tulips and Antirrhinums.

Mr. Amos Perry, Enfield, N., for Pæonies and herbaceous plants.

Mr. G. Reuthe, Keston, Kent, for shrubs and herbaceous plants.

Mr. Charles Turner, Slough, for Roses, Azaleas, and Lilacs.

Messrs. Allwood, Haywards Heath, for Carnations.

Mr. A. J. A. Bruce, Chorlton-cum-Hardy, for Sarracenias.

Mr. A. F. Dutton, Iver, Bucks, for Carnations.

Messrs. Fletcher, Chertsey, for Rhododendrons.

Mr. W. Icton, Putney, S.W., for Lilies of the Valley.

Messrs. Paul, Cheshunt, for Roses.

Messrs. Phillips and Taylor, Bracknell, for alpine and hardy flowers.

Messrs. T. Rivers, Sawbridgeworth, for Vines and Citrus Fruits.

Silver-gilt Flora Medal.

- Messrs. Artindale, Sheffield, for herbaceous flowers.
 Messrs. Barr, Covent Garden, for hardy flowers.
 Messrs. Blackmore & Langdon, Twerton-on-Avon, for Delphiniums.
 Mr. J. Box, Haywards Heath, for hardy plants.
 Messrs. Cartwright & Goodwin, Kidderminster, for Tulips.
 Messrs. Clark, Dover, for herbaceous plants and alpine.
 Messrs. W. Cutbush, Highgate, for Carnations.
 Messrs. J. Cypher, Cheltenham, for foliage plants.
 Messrs. Dickson & Robinson, Manchester, for Tulips.
 Messrs. Gunn, Olton, for new Phloxes.
 Messrs. J. Hill, Lower Edmonton, for exotic Ferns.
 Messrs. S. Low, Bush Hill Park, N., for Roses.
 Mr. R. C. Notcutt, Woodbridge, for flowering plants.
 Messrs. W. Paul, Waltham Cross, for hardy plants.
 Messrs. J. Peed, West Norwood, for Caladiums.
 Mr. George Prince, Longworth, Berks, for Roses.
 Messrs. J. Veitch, Chelsea, for flowering shrubs.
 Messrs. T. S. Ware, Feltham, for hardy flowers.
 Messrs. Young, Cheltenham, for Carnations.

Silver-gilt Banksian Medal.

- Messrs. Bees, Mill Street, Liverpool, for alpine.
 Messrs. W. Cutbush, Highgate, for flowering plants.
 Messrs. G. Gibson, Bedale, for herbaceous plants.
 Messrs. Harkness, Bedale, for herbaceous plants.
 Messrs. Hobbies, East Dereham, for Roses.
 Mr. L. R. Russell, Richmond, S.W., for foliage plants and Clematis.

Silver Flora Medal.

- Messrs. R. H. Bath, Wisbech, for Tulips.
 Mr. J. Box, Lindfield, Sussex, for Sweet Peas.
 Messrs. S. Low, Bush Hill Park, for Australian plants.

Silver Banksian Medal.

- Mrs. V. A. Litkie, Maidenhead (gr. W. Hulbert), for Schizanthus.
 C. Waley, Esq., Stone House, Reigate, for Schizanthus.
 Messrs. Barr, Covent Garden, W.C., for Japanese Pygmy Trees.
 Messrs. Brown, High Street, Stamford, for Lilacs and Gaillardias.
 Messrs. J. Jefferies, Cirencester, for Tulips.
 Messrs. H. J. Jones, Lewisham, S.E., for Pelargoniums, Fuchsias, and Phlox.

Bronze Flora Medal.

- Messrs. Godfrey, Exmouth, for Pelargoniums and Veronicas.
 Mr. Philip Ladds, Swanley, for Zonals and Hydrangeas.

Silver-gilt Knightian Medal.

- The King's Acre Nurseries, Hereford, for fruit trees.
 Messrs. Laxton, Bedford, for fruit trees and Strawberries.

EXHIBITS IN THE TABLE TENT.

Gold Medal.

Sir Everard Hambro, K.C.V.O., Hayes, Kent (gr. J. Grandfield),
for alpiners.

Hon. Vicary Gibbs, Elstree (gr. E. Beckett, V.M.H.), for vegetables.

Messrs. F. Cant, Colchester, for Roses.

Messrs. Dobbie, Edinburgh, for Sweet Peas.

Large Silver Cup.

Messrs. B. R. Cant, Colchester, for Roses.

Messrs. J. Veitch, Chelsea, S.W., for greenhouse plants.

Silver Cup.

Messrs. J. Backhouse, York, for rock and alpine plants.

Messrs. F. Smith, Woodbridge, for herbaceous plants.

Messrs. Sutton, Reading, for Sweet Peas.

Messrs. Sutton, Reading, for vegetables.

Standard Cup.

Hon. J. Ward, C.V.O., Hungerford (gr. C. Beckett), for Melons.

Messrs. A. Dickson, Newtownards, for Roses and Tulips.

Silver-gilt Flora Medal.

Leopold Salomons, Esq., Dorking (gr. G. Kent), for Hydrangeas.

Messrs. S. Bide, Farnham, for Sweet Peas.

Mr. E. J. Hicks, Hurst, Twyford, for Roses.

Messrs. E. W. King, Coggeshall, for Sweet Peas.

Mr. J. Stevenson, Wimborne, for Sweet Peas.

Messrs. R. Sydenham, Birmingham, for Sweet Peas.

Messrs. T. S. Ware, Feltham, for Begonias.

Silver-gilt Banksian Medal.

Dr. J. MacWatt, Morelands, Duns, for Primulas.

Messrs. J. Backhouse, York, for hardy flowers.

Mr. R. J. Barnes, Malvern, for Roses.

Messrs. R. H. Bath, Wisbech, for Sweet Peas.

Mr. Christopher Bourne, Bletchley, for Tulips.

Messrs. Burch, Peterborough, for Roses.

Mr. H. Burnett, Guernsey, for Carnations.

Messrs. H. Cannell, Swanley, for fruit and vegetables.

Mr. J. Douglas, Great Bookham, for Border Carnations.

Mr. H. Hemsley, Crawley, for alpiners.

Mr. Vernon T. Hill, Langford, Bristol, for alpiners.

Messrs. Kelway, Langport, Somerset, for herbaceous plants.

Messrs. R. P. Ker, Aigburth, Liverpool, for Amaryllis.

Messrs. Ladhams, Shirley, Hants, for hardy plants.

Mr. Frank Lilley, Guernsey, for Gladioli and Iris.

Messrs. S. Low, Bush Hill Park, for Carnations.

cii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Mr. G. W. Miller, Wisbech, for herbaceous plants.
Messrs. Paul, Cheshunt, for Lilacs.
Messrs. Sutton, Reading, for Tulips.

Silver Flora Medal.

Mr. Bertie Bell, Guernsey, for Carnations.
Messrs. J. Cocker, Aberdeen, for Trollius and Anemones.
Mr. H. H. Crane, Archway Road, Highgate, for Violas and Violettas.
Messrs. Gunn, Olton, for hardy plants.
Mr. A. Ll. Gwillim, Eltham, for Begonias.
Miss Hemus, Upton-on-Severn, for Sweet Peas.
Messrs. Hogg & Robertson, for Tulips.
To the Ightham Alpine Nursery, for rock plants and alpiners.
Messrs. J. Peed, W. Norwood, for Gloxinias and Streptocarpus.
Messrs. Reamsbottom, Geashill, Ireland, for St. Brigid Anemones.
Messrs. Seagrave, Sheffield, for Violas.
Messrs. Thompson & Charman, 11 Adam Street, W.C., for alpiners and hardy flowers.

Silver Knightian Medal.

Messrs. G. Bunyard, Maidstone, for stored Apples.
Messrs. James Carter, Raynes Park, for vegetables.
Thatcham Fruit and Flower Farm, Newbury, for vegetables and salads.

Silver Banksian Medal.

Mr. E. F. Allard, Merton, for Calceolarias.
A. P. Brandt, Esq., Bletchingley, for Pelargoniums.
H. B. Brandt, Esq., Nutfield, for Streptocarpus and foliage plants.
Rev. H. Buckston, Sutton-on-the-Hill, Derby, for Calceolarias.
Stuart Maples, Esq., Stevenage, for alpiners.
E. Mocatta, Esq., Addlestone (gr. T. Stevenson), for Schizanthus.
E. J. Wootten, Esq., Eastleigh, for Carnations.
Messrs. Barrie & Brown, 39 King William Street, E.C., for hardy plants.
Mr. A. H. Cole, Camberwell, S.E., for hardy plants.
Mrs. Lloyd Edwards, Llangollen, for alpiners.
Mr. H. N. Ellison, W. Bromwich, for Ferns and Cacti.
Messrs. Gilbert Dyke, Bourne, for Anemones.
Messrs. John Forbes, Hawick, N.B., for hardy flowers.
Mr. W. Lawrenson, Yarm-on-Tees, for Primulas and alpiners.
Lissadell Bulb Farm, Sligo, for hardy Primulas.
Mr. James MacDonald, Harpenden, for grasses.
Messrs. Carter Page, London Wall, E.C., for Dahlias and Violas.
Mr. R. Prichard, Wimborne, for alpiners.
Messrs. Rich, Bath, for hardy plants.
Mr. G. R. Smith, New Thundersley, for Cacti.
Mr. G. Underwood, Leicester, for Violas and Pansies.

Messrs. Waterer, Sons, & Crisp, Bagshot, for Tulips.
 Mr. J. D. Webster, Chichester, for Sweet Peas.
 Mr. W. Wells, Merstham, for Antirrhinums and Carnations.
 Messrs. Whitelegge & Page, Chislehurst, for alpinies.

Bronze Flora Medal.

J. J. Ward, Esq., Rocklands, Finchley, N. (gr. J. Willis), for Calceolarias.

Mr. E. C. Howell, Cheltenham, for alpinies.

The Burton Hardy Plant Nurseries, Christchurch, for rock plants.

Silver-gilt Cup.

The Bromsgrove Guild, for pictures and statuary.

Silver Cup.

Messrs. Crowther, Fulham, for garden ornaments.

Silver Banksian Medal.

E. White, Esq., F.R.H.S., 7 Victoria Street, S.W., for garden plans.

Bronze Banksian Medal.

Messrs. J. Cheal, Crawley, for garden plans.

Messrs. R. Wallace, Colchester, for garden plans.

Certificate of Appreciation.

The John Innes Institute, Merton, Surrey, for Calceolarias.

HORTICULTURAL SUNDRIES.

Standard Cup.

Messrs. Jas. Carter, Raynes Park, for scientific seed testing apparatus, drawings, &c.

Messrs. Sutton, Reading, for garden requisites.

The Yokohama Nursery Co., Kingsway, W.C., for miniature Japanese garden.

Silver-gilt Banksian Medal.

Messrs. J. Bentley, Barrow-on-Humber, for chemical specialities.

The Four Oaks Spraying Machine Co., Sutton Coldfield, for spraying apparatus.

Messrs. Fowler Lee, Reading, for fruit-bottling apparatus.

The Union of South Africa, for South African produce.

Messrs. Walter Voss, Millwall, E., for insecticides and fertilizers.

Silver Flora Medal.

Country Life, Tavistock Street, W.C., for gardening papers.

The Elsenham Jam Co., Elsenham, for preserved fruits.

Messrs. Headley, Bishopsgate, E.C., for garden books and pictures.

Silver Banksian Medal.

The Acme Patent Ladder Co., Earlsfield, S.W., for ladders.

Messrs. Barr, Covent Garden, W.C., for garden tools.

Messrs. Blake & Mackenzie, Liverpool, for flower-pots.

The Boundary Chemical Co., Liverpool, for ' Climax ' weed-killer.
 Messrs. H. W. Cashmore, Victoria Street, S.W., for garden ornaments.
 The Dryad Cane & Metal Works, Leicester, for garden seats.
 The En-Tout-Cas Co., Leicester, for garden seats.
 Messrs. Hartjen, Noble Street, E.C., for spraying machines.
 Messrs. Hartley & Sugden, Halifax, for boilers.
 Mr. Vernon T. Hill, Langford, Bristol, for slug traps.
 The London Provincial Building Co., for portable buildings.
 Mrs. Sophia Miller, Marlow, for Moyleen confections.
 Messrs. Major, Hull, for Solignum wood preservatives.
 Messrs. H. Pattisson, Streatham, for horse boots.
 Messrs. J. Pither, Uxbridge, for mushroom spawn.
 The Pullen Burry Hothouses, Bedford Square, W.C., for transverse travelling hothouses.
 Messrs. Purser, 92, Hatton Garden, W.C., for spraying apparatus.
 Messrs. Robinson, West Bromwich, for fertilizers and insecticides.
 Miss Hilda G. Sewell, 67 Harcourt Terrace, S.W., for Elmhurst preserves.

Bronze Banksian Medal.

Messrs. Abbott, Southall, for table trays.
 Mr. J. Bradley, Duffield, Derby, for a Bunty tea-house.
 The Garden City Trug Co., Fleet, for Trugs.
 Messrs. Jeyes, Cannon Street, E.C., for insecticides.
 Mr. A. Key, Norwich, for a miniature lawn.
 Messrs. Chas. P. Kinnell, Southwark Street, S.E., for heating apparatus.
 Mr. C. A. Peters, Derby, for a wood preservative.
 Mr. John Pinches, Crown Street, S.E., for garden labels.
 Messrs. Prentice, Stowmarket, for fertilizers.
 Mr. H. C. Slingsby, 142 Old Street, E.C., for ladder and barrows.
 Messrs. J. Unite, Edgware Road, W., for tents.
 Messrs. Vipan & Headley, Leicester, for garden seats.
 Mrs. W. M. Webb, Hanwell, for " Selborne " nesting boxes.
 Mr. H. E. Wemyss, 22 Motcombe Street, S.W., for reversible garden chairs.

GENERAL MEETING.

JUNE 3, 1914.

Prof. F. KEEBLE, F.R.S., Sc.D., in the Chair.

*Fellows elected (234).—*Mrs. C. Akroyd, Miss M. C. Allen, T. W. Allt, W. Anderson, M. B. de C. Andrade, W. Baldwin, Mrs. T. Barclay, D. M. Barcroft, M.D., Mrs. H. Bathurst, H. Beale, M. M. Beeton, J. E. Bennett, Mrs. R. H. Berney, F. L. Berry, Dr. A. Bevan, J. H. Birch, J. T. A. Bolton, F. Bond, M.A., A. E. Bowen, W. L. Bradbury, O. Bradshaw, J. G. Brierley, F. Bromwich, D. Brough, B. S. Bullivant,

Mrs. Burke, H. Burn, Mrs. G. Burnett, Mrs. Burrell, Mrs. J. H. Buxton, G. H. Capes, E. H. Carpmael, H. M. Carter, W. Carter, Mrs. C. J. Carver, Lumley Cator, J. H. Catten, Mrs. O. Channer, W. H. Charter, G. W. Chitty, Mrs. E. Chubb, Sir E. F. Coates, Bart., Jeanne Lady Coats, Hon. Mrs. Codrington, Mrs. B. Cokayne, Mrs. W. G. D. Cooper, Mrs. G. T. Crane, Lt.-Col. H. R. O. Cross, Mrs. Dalgleish, D. H. Davies, W. Dent, Mrs. G. D'Oyly, Miss M. E. L. Dickinson, J. Dixon, Mrs. Drabble, T. Driscoll, Sir F. G. Dumayne, Miss A. Dunn, Mrs. W. H. Lee Ewart, Dr. H. Faulkner, Miss V. Featherstonhaugh, Miss K. Felkin, J. W. Ferris, Miss C. Finlay, G. R. C. Foster, Dr. C. F. Fothergill, Mrs. A. V. Frere, Miss K. Galton, Mrs. C. Garrison, Mrs. O. Gutekunst, O. Gatehurst, Mrs. H. Geoghegan, Mrs. A. Giles, Mrs. Glossop, W. Goaring, Mrs. E. S. Gooch, Hon. Mrs. Goodenough, W. W. Green-slade, Mrs. Greenwood, Mrs. H. M. Gregory, F. H. Groome, Mrs. G. Hall, Mrs. L. G. S. Hancock, Sir L. Hare, K.C.S.I., Mrs. C. F. A. Hare, Mrs. M. C. Harris, J. W. Harrison, F. Harvey, G. Hayes, Mrs. H. C. Head, C. A. Heimann, Lady Muriel Herbert, Hon. George Herbert, C. J. Herbert, C. Herrin, Mrs. H. Higham, Mrs. F. Hilder, E. Hill, F.C.A., Mrs. H. Hill, G. W. Hippisley, Miss I. M. Hoare, P. J. Hobbs, G. D. Hobson, P. Hollander, R. P. Holmes, Miss F. M. Holroyd, Mrs. Hoyle, Mrs. W. Jackson, J. H. Johns, Mrs. P. Jude, J. Keegan, B.Sc., Miss E. Keith, Miss F. Keith, Mrs. Ker, H. J. King, Miss C. Landale, E. L. Levett, K.C., Mrs. L. A. Lewis, Lady Loch, R. F. Lucas, Mrs. A. A. Lyle, Mrs. D. McLean, Mrs. Macpherson, Miss C. L. Mager, Mrs. J. N. Mappin, L. A. Martin, Mrs. F. J. Matheson, Miss A. Matthews, Mrs. P. Maviogordato, Mrs. Meissner, Mrs. Meredyth, Mrs. H. J. O. Millar, Miss P. G. I. Milman, C. D. Moggridge, Mrs. Mowbray, Mrs. A. Murdoch, Mrs. J. G. Murdoch, Hon. Mrs. G. Napier, Miss I. Napier, J. Newman, Mrs. Newton, Mrs. Nicholl, E. Norton, Mrs. A. J. Oakshott, E. Owers, Hon. G. L. Parsons, C. C. Paterson, Mrs. Pawle, F. C. Peal, Hon. Lilian D. Pennant, Miss A. Pennington, A. W. H. Percy, Mrs. J. C. Pharo, Miss E. H. Phillimore, W. Pickering, Miss M. Piza, F. J. Pool, J. Pratt, Mrs. A. Preece, The Baroness Profumo, Mrs. W. Punchard, W. H. S. Pyman, Mrs. W. N. Raeburn, H. M. Rattray, Lieut. H. B. Rawlings, R.N., A. T. Redmayne, Miss A. H. Reed, D. D. Reid, Miss E. K. Richards, Mrs. P. W. Richardson, Miss G. Ridge-Jones, Mrs. E. Ritchie, T. Hogg Robertson, Mrs. W. P. Robinson, A. Robson, N. Rogers, C. J. Roope, H. Rothera, Miss M. Rotherham, R. P. Rowe, Miss C. Rundle, H. B. Sanders, Mrs. O. Schwann, W. Scott, J. R. Shingler, Mrs. Silver, Mrs. E. Smellie, Mrs. A. Robinson-Smith, Mrs. Reginald Spith, Mrs. W. S. Smith, L. J. Spencer, Miss E. Spicer, Mrs. J. S. Stanford, R. Staples-Browne, Miss C. Steel, Miss E. M. Stewart, W. H. Stocks, R. E. Storer, Mrs. J. Straker, Mrs. R. Strickland, Mrs. W. J. Stride, Miss M. E. Swaine, Col. Alan J. Sykes, Miss Tanner, Mrs. R. R. Tattersall, Mrs. Douglas Taylor, R. E. Thomas, W. F. Thomas, Miss J. Tozer, Mrs. H. Tremenheere, Miss C. Trevor, T. E. Trollop, Sir Robert Turnbull, M.V.O., W. Tylden-Pattenson, S. P. C. Vesey, J.P., C. J. Wainwright, H. Walker, B. Walmsley, Hon. Mrs. Egerton

Warburton, Col. H. H. Ward, Mrs. Ward, Mrs. F. Warren, W. Wells, jun., Miss A. M. White, R. Widdowson, Col. T. J. Hackett Wilkins, Mrs. J. Wilkinson, J. B. Willans, Mrs. S. J. Williams, R. Lloyd Woollcombe, LL.D., F.R.G.S., C. Yarde, A. Yeoman, H. Young, Mrs. Yule.

Fellows resident abroad (6).—J. B. Albertson (Holland), F. M. Clement (Canada), A. Eastman (Chile), B. Harrison, F.L.S. (N.S.W.), W. A. Jeffs (Canada), A. Steinbrücker (Germany).

Associates (3).—A. L. Eagles, Miss A. M. W. Moxhay, E. Young.

Societies affiliated (2).—Stevenage Hort. Mut. Imp. Soc., Tywardreath Gardening Soc.

A lecture on "Irisés" was given by Mr. W. R. Dykes, M.A. (see p. 226).

GENERAL MEETING.

JUNE 16, 1914.

Dr. D. H. SCOTT, M.A., F.R.S., in the Chair.

Fellows elected (110).—Mrs. F. E. Adams, Mrs. P. Barlow, Hon. Hubert Beaumont, Mrs. G. Beck, Mrs. A. Benn, G. W. Bennett, Mrs. Selby Bigge, Miss M. Billson, J. Bridge, Mrs. H. Broad, D. A. Bumsted, L. Caldecott, F. N. Campbell, J. Catto, Major A. S. Cave, A. Champernowne, P. T. Chatterton, Mrs. Chichester, C. M. R. Cleeve, S. D. Coates, D.L., J.P., Miss J. Cockerton, The Countess of Cranbrook, Mrs. Page Croft, Mrs. Dean, L. S. Dixon, B. Drage, E. F. Duncanson, Miss C. M. Duncanson, Mrs. W. S. Eastwood, Mrs. F. Fenwick, Mrs. G. V. Frere, Hon. Hugh Godley, Miss A. Grant, Miss M. M. Green, Mrs. B. F. Halford, W. H. Hall, G. W. Harden, V. C. Harden, Mrs. Harrison, J. Haws, Mrs. C. Q. Henriques, Mrs. E. E. M. Hett, Mrs. D. B. Hewitt, J. W. Hills, E. Hodges, Mrs. S. Humphries, Mrs. M. Jackson, A. Pearce Jones, Mrs. F. Kayser, H. Langdon, C. Lawrence, E. D. Lawson, Miss J. M. Le Geyt, Mrs. E. E. Leviansky, Mrs. T. E. Liddiard, Mrs. J. McConnel, Miss J. C. C. Macdonald, A. McNeill, Mrs. Magor, Mrs. B. Mather, Mrs. F. M. Mathews, Mrs. W. H. Matthews, Mrs. L. Micklem, Miss C. B. Midwood, Mrs. M. S. Mocatta, Mrs. C. L. Morrison, C. A. Palmar, Lady Pearson, Mrs. L. M. Pedlev, B. E. Pemberton, Miss H. Philpot, Mrs. S. Politzer, Mrs. Poole, R. H. Posnett, Miss E. M. B. Powell, T. Prentice, A. E. Rixon, H. Rixon, Mrs. G. Robarts, Dr. A. W. Rowe, S. Sargent, F. C. Savage, Miss D. M. Saxton, O. B. Schuster, Mrs. Segnitz, Mrs. H. W. Slade, Mrs. A. W. Smith, A. J. G. Stancomb, Hon. J. R. N. Stopford, Mrs. Sturt, F. C. de Sumichrast, Miss A. Templer, Mrs. W. A. Toll, Mrs. A. M. Townsend, Mrs. C. O. Trew, Rev. C. Tristram, F. S. Tuckett, W. H. Turner, G. Vickery, Mrs. C. M. Villiers-Stuart, Mrs. T. A. Walker, Mrs. Wartnaby, Mrs. R. G. Wickham, Lady Wiggin, Mrs. S. Wilde, G. Willan, Mrs. J. B. Wimble, Col. H. C. M. Woods, C. Yeo.

Fellows resident abroad (3).—Mrs. G. Chirnside (Melbourne, Australia), G. H. Ridley (Cape Town, S.A.), James Young (Christchurch, N.Z.).

Associates (3).—E. C. Barrett, Miss T. G. Fisher, F. A. Griffiths.

Societies affiliated (2).—Farnham Field Club; The Master and Fellows of Trinity College, Cambridge.

The Eleventh Masters Memorial Lecture, on "Plants in relation to their Environment," was given by Prof. J. Bretland Farmer, Sc.D., F.R.S. (see p. 197).

HOLLAND PARK SHOW.

JUNE 30, JULY 1 AND 2, 1914.

LIST OF JUDGES.

ORCHIDS.

(Amateurs' Groups.)

Bolton, W.

Cypher, J., V.M.H.

Sander, F., V.M.H.

(Nurserymen's Groups.)

Fowler, J. Gurney

Shill, J. E.

Crawshay, de Barri

ROSES.

Page Roberts, Rev. F.

Jefferies, W. J.

Piper, T. W.

CARNATIONS.

Jennings, J.

MacLeod, J. F.

Turner, Arthur

TUBEROUS BEGONIAS.

Blick, C.

Chapman, A.

FOLIAGE PLANTS.

Bain, W.

Baker, W. G.

Hudson, J., V.M.H.

Wythes, G., V.M.H.

OTHER FLOWERING PLANTS.

Howe, W.

Thomas, Owen, V.M.H.

Page, W. H.

Turner, T. W.

SWEET PEAS.

Bates, W.

Curtis, C. H.

Watkins, A.

FRUIT AND VEGETABLES.

Challis, T., V.M.H.

Poupart, W.

Reynolds, G.

Rollit, Sir Albert K., LL.D.

HARDY HERBACEOUS PLANTS AND GORDON-LENNOX CHALLENGE CUP.

Beckett, E., V.M.H.

Gibbs, Hon. Vicary

Hales, W.

Notcutt, R. C.

Paul, G., V.M.H.

Shea, C. E.

ROCK, ALPINE, AND WATER GARDENS.

Bedford, A.

Bilney, W. A., J.P.

Bowles, E. A., M.A.

Divers, W. H., V.M.H.

HORTICULTURAL SUNDRIES.

Allan, A. R.

Basham, J.

Markham, H.

Woodward, G.

cviii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

PLANTS NOT INCLUDED IN ABOVE.	CLAY CHALLENGE CUP.
Davis, J.	Bowles, E. A., M.A.
Dixon, C.	Nix, C. G. A.
	Maud, Miss
SHERWOOD AND WIGAN CUPS.	AFFILIATED SOCIETIES' SUMMER CUP.
Green, J.	
Pearson, A. H., V.M.H.	Pearson, C. E.
Wigan, A. L.	Cheal, J.

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION
WITH THE JUDGES.

THE order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Floral and Orchid Committees will be found in their respective reports.

The Coronation Cup (for most meritorious Exhibit in the Show).

Messrs. Wallace, Colchester, for Water Garden and Japanese Iris.

The Wigan Cup (for Roses).

Mr. Elisha J. Hicks, Twyford.

The Clay Challenge Cup (for a Rose not in commerce, possessing the true old Rose scent).

Messrs. W. Paul, Waltham Cross, for Rose 'Queen of Fragrance.'

The Affiliated Societies' Summer Cup, for Hardy Flowers.

To be won and afterwards offered annually as a Challenge Cup by the committee of the winning society for competition at their own local Show.

The Dulwich Horticultural Society. Secretary, Mr. R. B. Leech.

Gold Medal.

Sir Randolph Baker, Bart., Blandford (gr. Mr. A. E. Usher), for Sweet Peas.

Sir Jeremiah Colman, Bart., Gatton Park, Surrey (gr. Mr. J. Collier), for Orchids.

The Hon. Vicary Gibbs, Elstree (gr. Mr. E. Beckett, V.M.H.), for vegetables.

Messrs. Blackmore and Langdon, Bath, for Begonias.

Messrs. Dobbie, Edinburgh, for Sweet Peas.

Mr. C. Engelmann, Saffron Walden, for Carnations.

Messrs. J. Hill, Edmonton, for Ferns.

Messrs. H. B. May, Upper Edmonton, for exotic ferns.

Messrs. Paul, Cheshunt, for Roses.

Messrs. W. Paul, Waltham Cross, for Roses.

Messrs. Sander, St. Albans, for Orchids.

Messrs. Sutton, Reading, for Sweet Peas.

Messrs. James Veitch, Chelsea, for Fruit Trees in pots.

Messrs. R. Wallace, Colchester, for Water Garden and Flower Garden.

Silver-gilt Cup.

Lt.-Col. Sir George Holford, K.C.V.O., Tetbury (gr. Mr. H. G. Alexander), for Orchids.

The Hon. Vicary Gibbs, Elstree (gr. Mr. E. Beckett, V.M.H.), for Chinese Plants.

Messrs. E. W. King, Coggeshall, for Sweet Peas.

Mr. M. Prichard, Christchurch, for hardy flowers.

Messrs. T. Rivers, Sawbridgeworth, for Fruit Trees in pots.

Messrs. Waterer, Sons, & Crisp, Bagshot, for alpiners, Rhododendrons, and herbaceous plants.

Large Silver Cup.

Messrs. Flory & Black, Slough, for Orchids.

Messrs. S. Low, Enfield, for Orchids.

Messrs. Mansell & Hatcher, Leeds, for Orchids.

Silver Cup.

Mr. James Box, Lindfield, for hardy plants.

Messrs. G. Bunyard, Maidstone, for Fruit Trees in pots.

Messrs. J. Carter, Raynes Park, for Water Garden.

Messrs. Charlesworth, Haywards Heath, for Orchids.

Messrs. Clark, Dover, for herbaceous flowers and aquatics.

Messrs. E. H. Davidson, Twyford, for Orchids.

Messrs. A. Dickson, Newtownards for Sweet Peas.

Messrs. J. K. King, Coggeshall, for Sweet Peas.

Messrs. Laxton, Bedford, for Strawberries.

Mr. Amos Perry, Enfield, for Water Garden.

Mr. L. R. Russell, Richmond, for Stove Plants.

Messrs. R. Wallace, Colchester, for herbaceous plants.

Messrs. T. S. Ware, Feltham, for Begonias.

Mr. J. Wood, Boston Spa, for Rock and Water Garden.

Messrs. Young, Cheltenham, for Carnations.

Standard Cup.

Mary, Countess of Ilchester, Holland House (gr. Mr. C. Dixon), for Sedums, Sempervivums, and Saxifrages.

Lord North, Wroxton Abbey, Banbury (gr. Mr. E. R. Janes), for Sweet Peas.

Sir Daniel Gooch, Hylands, Chelmsford (gr. Mr. W. Heath), for Vegetables.

Col. The Rt. Hon. Mark Lockwood, Romford (gr. Mr. G. Craddock), for Fuchsias.

Messrs. J. Carter, Raynes Park, for Sweet Peas.

Messrs. W. Fromow, Chiswick, for Japanese Maples.

Mr. A. L. Gwillim, Sidcup, for Begonias.
 Messrs. Hobbies, Dereham, for Sweet Peas.
 Messrs. J. Piper, Bayswater, for rock and water garden.
 Mr. L. R. Russell, Richmond, for trees and shrubs.

Silver Lindley Medal.

Mr. H. G. Alexander, Westonbirt Gardens, Tetbury, for Orchid culture.

Silver-gilt Flora Medal.

W. S. Edwardson, Esq., Sidcup, for Begonias.
 Messrs. B. R. Cant, Colchester, for Roses.
 Messrs. F. Cant, Colchester, for Roses.
 Mr. A. F. Dutton, Iver, Bucks, for Carnations.
 Messrs. S. Low, Enfield, for Roses.

Silver-gilt Banksian Medal.

Messrs. Bakers, Wolverhampton, for hardy plants.
 Messrs. S. Bide, Farnham, for Sweet Peas.
 Messrs. Blackmore & Langdon, Bath, for Delphiniums.
 Messrs. G. Bunyard, Maidstone, for herbaceous plants.
 Messrs. Godfrey, Exmouth, for Campanulas and Pelargoniums.
 Messrs. Pulham, Oxford Street, W., for formal and rock gardens.
 Messrs. S. Low, Enfield, for Begonias.
 Messrs. Carter Page, London Wall, for Dahlias, Pelargoniums and
 Violas.

Mr. Amos Perry, Enfield, for Ferns.
 Mr. M. Prichard, Christchurch, for alpine plants.
 Mr. C. Turner, Slough, for Roses.

Silver Flora Medal.

The Rev. L. Chalmers-Hunt, Hitchin, for Roses and Sweet Peas.
 Messrs. Barr, Covent Garden, for cut flowers.
 Messrs. R. H. Bath, Wisbech, for herbaceous plants.
 Messrs. Bees, Chester, for alpine, Primulas, and Chinese plants.
 Mr. J. Box, Lindfield, for Sweet Peas.
 Messrs. Brown, Stamford, for herbaceous plants.
 Mr. H. Burnett, Guernsey, for Carnations.
 Messrs. J. Cheal, Crawley, for formal and rock gardens.
 Messrs. J. Cheal, Crawley, for clipped trees.
 Mr. H. H. Crane, Highgate, for Violas.
 Messrs. Cuthbert, Southgate, for flowering plants.
 Messrs. A. Dickson, Newtownards, for Roses.
 Mr. Hugh Dickson, Belfast, for seedling Roses.
 Donard Nursery Co., Co. Down, for Leptospermums, Eucalyptus,
 and Pittosporums.
 Mr. C. Elliott, Stevenage, for alpine.
 Mr. E. J. Hicks, Twyford, for Roses.
 Messrs. Jackman, Woking, for Roses.
 Messrs. Jackman, Woking, for Clematis.

Messrs. Jackman, Woking, for herbaceous flowers.
 Messrs. H. J. Jones, Lewisham, for Phloxes and Campanulas.
 Messrs. Kelway, Langport, for Delphiniums, and Pæonies.
 Mr. J. MacDonald, Harpenden, for Grasses.
 Mr. R. C. Notcutt, Woodbridge, for Roses.
 Messrs. J. Peed, West Norwood, for Caladiums.
 Mr. G. Prince, Oxford, for Roses.
 Mr. G. Reuthe, Keston, for rockery and shrubs.
 Messrs. Seagrave, Sheffield, for Violas.
 Mr. V. Slade, Taunton, for Pelargoniums.
 Messrs. F. Smith, Woodbridge, for herbaceous flowers.
 Messrs. Thompson & Charman, Bushey, for herbaceous plants.
 Mr. C. Turner, Slough, for Carnations.
 Mr. C. F. Waters, Balcombe, for Orchids.
 Messrs. Whitelegg & Page, Chislehurst, for alpine.

Silver Knightian Medal.

Messrs. S. Low, Enfield, for Fig trees.
 Messrs. T. S. Ware, Feltham, for Fruit trees.
 Messrs. E. Webb, Stourbridge, for Melons.

Silver Banksian Medal.

J. S. Arkwright, Esq., Kinsham Court, Presteign (gr. Mr. W. Bevan)
 for *Lychnis Arkwrightii*.

A. Donnithorne, Esq., Ashburton, Devon, for Begonias.

W. M. Gott, Esq., Trenyhton, Cornwall (gr. Mr. G. Hillman), for
 Carnations.

Messrs. Barr, Covent Garden, for rock and water garden.

Messrs. G. Bunyard, Maidstone, for Roses.

Messrs. H. Cannell, Eynsford, for Cannas and Pelargoniums

Messrs. W. Cutbush, Highgate, for Carnations.

Mr. H. Dixon, Wandsworth, for Orchids.

Mr. J. Douglas, Great Bookham, for Border Carnations.

Messrs. John Forbes, Hawick, for Phloxes and Pentstemons.

Messrs. G. Gibson, Bedale, for Pæonies and Delphiniums.

Guildford Hardy Plant Nursery, Guildford, for herbaceous flowers.

Messrs. Harkness, Bedale, for Poppies, Lupines, &c.

Mr. H. Hemsley, Crawley, for alpine.

Messrs. Hobbies, Dereham, for Roses.

Messrs. Kent & Brydon, Darlington, for rock garden and hardy
 flowers.

Mr. P. Ladds, Swanley, for Hydrangeas, Fuchsias, and Pelargoniums.

Messrs. B. Ladhams, Southampton, for hardy flowers.

Mr. H. Lakeman, Thornton Heath, for Border and Tree Carnations.

Messrs. S. Low, Enfield, for Carnations.

Messrs. H. B. May, Edmonton, for flowering plants.

Mr. G. W. Miller, Wisbech, for herbaceous plants.

Messrs. Paul, Cheshunt, for Pæonies and shrubs.

Messrs. J. Piper, Bayswater, for clipped trees.
 Mr. R. Prichard, Wimborne, for alpinæ.
 Messrs. Rich, Bath, for herbaceous flowers.
 Messrs. G. Stark, Great Ryburgh, for Sweet Peas and Kniphofias.
 Messrs. R. Tucker, Oxford, for alpinæ.
 Messrs. R. Wallace, Colchester, for alpinæ.
 Mr. J. D. Webster, Chichester, for Sweet Peas.
 Messrs. Whitelegg & Page, Chislehurst, for herbaceous plants.

Bronze Flora Medal.

Mr. A. Campbell, Harrogate, for alpine garden.
 Messrs. H. Cannell, Swanley, for herbaceous plants.
 Mr. H. N. Ellison, West Bromwich, for Cacti and Ferns.
 Guildford Hardy Plant Nursery, Guildford, for rock garden.
 Messrs. Jarman, Chard, for Sweet Peas.
 Mr. W. A. Manda, St. Albans, for ferns and decorative plants.
 Messrs. Morse, Woodbridge, for Roses.
 Mr. H. Newman, Watford, for Border Pinks.
 Mr. G. R. Smith, New Thundersley, for Cacti.
 Mr. C. Turner, Slough, for flowering shrubs.
 Messrs. E. Webb, Stourbridge, for Sweet Peas.
 Messrs. W. Wells, Merstham, for Carnations.
 Mr. E. J. Wootten, Eastleigh, for Carnations.

Bronze Banksian Medal.

Messrs. R. Sydenham, Birmingham, for Sweet Peas.

GENERAL MEETING.

JULY 14, 1914.

Dr. D. H. SCOTT, M.A., F.R.S., in the Chair.

Fellows elected (56).—Mrs. W. H. Ash, Lieut.-Col. J. E. H. Balfour, Mrs. O. C. Bevan, F. W. Bishop, G. Bott, Mrs. J. C. Budd, Miss E. F. Carbonell, Mrs. T. F. Carnell, G. R. Carr, Mrs. J. C. Chaplin, Mrs. T. R. Curtis, Mrs. C. Curwen, F. Deacon, Mrs. R. Huyshe Eliot, F. Glenny, Mrs. Martin Hall, Mrs. J. L. Hendy, Miss J. Herbert, G. Hewat, J. A. Holms, G. P. Hope, H. Jackson, A.C.P., T. Kerridge, Mrs. P. Leese, T. A. Lowe, G. E. Lowenthal, Mrs. D. Marjoribanks, E. W. May, G. Mayer, Lady Mary Meynell, Mrs. F. D. Millet, T. A. Mitchell, T. A. Murch, Capt. W. E. Napier, A. W. Ogden, Mrs. J. R. Parsons, A. A. Paton, Mrs. Hamlyn Price, G. Rimmer, A. H. Roberts, Lady Robertson, C. J. Selley, L. E. Snelgrove, Mrs. R. Soames, F. Sowels, Surg.-Gen. Stevenson, C.S.I., Mrs. H. B. Tate, Ll. M. Thomas, P. Tonks, A. Vigor, Mrs. J. M. Viney, Miss H. E. Wainwright, Mrs. F. Walker, G. Watson, Mrs. F. S. Weinberg, R. Williams.

Fellows resident abroad (3).—W. Attwood (Cape Town), J. Giles (Victoria, B.C.), Mrs. Willard (New York).

Associates (3).—C. McLaren, Mrs. C. McLaren, J. Thompson.

The Twelfth Masters Memorial Lecture, on "Plants in relation to their Environment," was given by Prof. J. Bretland Farmer, Sc.D., F.R.S. (see p. 208).

FRUIT-PACKING COMPETITION, JULY 14, 1914.

Silver Knightian Medal.

To the Swanley Horticultural College, Kent.

Silver Banksian Medal.

To Mr. C. A. Streeten, High Hilden, Tonbridge.

GENERAL MEETING.

JULY 28, 1914.

Prof. F. KEEBLE, Sc.D., F.R.S., in the Chair.

Fellows elected (27).—Major-Gen. Sir George Barker, K.C.B., F. G. Bealing, L. B. Benham, Miss B. C. Black, C. Burrell, Mrs. Somervail Clerk, Mrs. J. W. Cook, J. H. Davies, Miss L. M. Decley, Mrs. A. Dunkels, The Earl of Dysart, Mrs. A. Elkin, S. Frewer, A. G. Fryett, T. Hayes, E. A. Haywood, R. J. Ludford, J. Lugg, Miss E. Mackinnon, J. F. S. Oakes, Mrs. Omodie-Curtis, Mrs. Robertson-Eustace, W. A. Stevenson, Mrs. A. Stiebel, Lady Sydenham, W. Davies Williams, H. Woodhouse.

Fellows resident abroad (10).—J. Blokker (Holland), G. H. Eady (Gold Coast), A. J. Guilbert (Guernsey), J. N. Milsum (F.M. States), Clement Moore (U.S.A.), C. A. Page (U.S.A.), P. W. Popp (U.S.A.), Knowles A. Ryerson (U.S.A.), G. B. Set (India), Mrs. R. B. Strassburger (U.S.A.).

Associates (2).—Miss N. Grant, Miss Shillidy.

Society affiliated (1).—Umtali Hort. Soc.

A lecture on "Swiss and Alpine Flora" was given by the Rev. Canon Horsley, M.A.

SCIENTIFIC COMMITTEE.

MAY 5, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Pelargonium hybrids.—Mr. J. Fraser, F.L.S., continued his remarks upon *Pelargonium* hybrids, dealing with those into whose composition *P. quercifolium* had entered. The complete record of his examination of these forms will be published in the JOURNAL of the Society later on.

Scale Insect on Furze.—The Rev. W. Wilks, V.M.H., exhibited a branch of Furze thickly infested with a cottony-white insect looking very much like a scale insect, and probably identical with *Pseudococcus ulmi*, which has previously been recorded as attacking that plant.

Malformed Rose.—Miss Collin sent from Surbiton a very curious malformed Rose, which Mr. W. C. Worsdell, F.L.S., took for further investigation (see p. cxvi).

Beech with curious root growth.—A specimen of Beech came from Mr. P. T. Godsall, of Iscoid Park. The tree had been, it is supposed, struck by lightning and partly killed; the upper living portion had sent out roots which had grown down, branching as they went, to the ground, beneath the dead bark. This kind of growth is not infrequent in Willows.

"*Fire*" in *Tulips*.—Rev. Canon Fowler said that this season the Tulips in his garden were remarkably free from "fire," though last season they had been badly diseased. Mr. F. J. Chittenden said that plants in his garden exposed to wind had suffered badly, but in the Tulip trial in the Wisley Garden scarcely any disease was to be seen. There they had been protected by putting branches of Broom between the beds.

Schizanthus malformed.—A *Schizanthus* in which the flowers had apparently been displaced by vegetative shoots was received from Mr. Crosswell, of Pickhurst Manor, Hayes, and referred to Mr. Worsdell for further examination (see p. cxvi).

Uncommon Plants.—Messrs. Perry exhibited *Iris minuta* with narrow-petalled yellowish flowers about an inch across, native of Japan, and *Glaucidium palmatum*, a beautiful Ranunculaceous plant, with divided bracts on the single-flowered scapes, and a mauve flower, about two inches in diameter, with yellow stamens, native of the same country.

Hippeastrum vittatum \times *H. calyptratum*.—Mr. A. Worsley made the following remarks concerning the hybrid *Hippeastrum* exhibited on March 24 (see p. xlv): "The Amaryllaceae genuinae form a tribe distinguished from the Coronatae, on the one hand, and from the

Pancratieae, on the other, by the absence of either corona or staminal cup. However, traces of a corona can be discerned in several members of the genus *Hippeastrum* indigenous to the Organ Mountains of South Brazil. In *H. calyptratum* this organ is well developed, and it is interesting to observe the changes which occur when this species is used as a pollen parent in hybridizing.

"In *H. vittatum* the throat of the tube is not ringed with any visible corona, although a ring of red pigment is usually present. In place of a corona there are tufts of whitish hairs,* and so the throat in *H. vittatum* is said to be 'bearded.' In the hybrid all three characters are present in modified forms. In place of the continuous corona of the male parent there is an interrupted ring of processes in various degrees of relief, coloured red, and crested with tufts of ruddy and whitish hairs.

"This interesting structural change follows the law which I have observed in all interspecific hybrids which have come under my own observation, *i.e.* that the characters of the hybrid show a balance between those of the parents. If they do not constitute an approximate mean between the parental extremes, they at least hold some position comprised within these extremes.

"I have found no instances of absolute dominance or recessivity in the characters of interspecific hybrids."

SCIENTIFIC COMMITTEE, JUNE 3, 1914.

Mr. A. E. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with eight members present, and Mr. W. R. DYKES, visitor.

Fungus attack upon Nymphaea.—Mr. J. R. Ramsbottom reported as follows upon the fungus attack on foliage of *Nymphaea*:

"A leaf of *Nymphaea* sent to me by Mr. Bowles, and exhibited at the last meeting, showed two rows of large holes parallel to the midrib. An examination of the decayed tissues showed fungus spores, together with certain algæ, diatoms, &c. The fungus proved to be one of the Hyphomycetes. It was first described by Allescher in 1895 as *Ploeosporium nymphaearum*. He had gathered it on living leaves of *Nymphaea alba*, *flava*, *odorata*, and *Nuphar luteum* in the Munich Botanic Garden. Bresadola had the fungus sent to him from Brandenburg, and, not realizing he had the same fungus as Allescher, described it under the name *Ramularia nymphaeae*, later as *Ovularia nymphaeae*. Allescher afterwards pointed out that the fungi were identical, but that owing to having had old specimens he had been misled by the tearing of the epidermis of the host plant caused by the rapid growth of the fungus. He holds that *Ovularia* is the correct genus, and, of course, the first specific name, *nymphaearum*, must stand. Judging from the specimens I have seen, *Ramularia*,

* Perhaps these hairs may not be invariably present in *H. vittatum* (true). Twenty-five years ago I noted an unbearded specimen, but the male parent of this hybrid here described is bearded.

rather than *Ovularia*, would seem to be the correct genus, as the mature spores apparently become septate. I have found the fungus growing on wild Water Lilies at Wicken Fen, Cambridge, during the autumn of last year."

Rose malformed.—Mr. W. C. Worsdell, F.L.S., said he had examined the Rose sent to the last meeting by Miss Collin (p. cxiv), and had found the calyx normal, and all the petals save one changed into foliage-leaves. Proliferation into a second flower had occurred, the calyx of which merged imperceptibly in a complicated way into the virescent, superior carpels of the primary flower. This is an uncommon abnormality, as it is usually the calyx, not the corolla, which exhibits phyllody.

Malformed Schizanthus.—Mr. Worsdell also reported that he found virescence and proliferation of all the flowers of the inflorescence in the specimen shown at last meeting (p. cxiv). Each flower has become changed into an inflorescence consisting of a number of minute rudimentary, axillary, virescent flowers, with no definite arrangement of their parts.

Gall on Daphne Mezereum.—Dr. Rendle reported that Mr. B. F. Cummings, of the Natural History Museum, had kindly examined the galls on *Daphne Mezereum* shown by Mr. W. E. Ledger at a previous meeting, and considered it not at all unlikely that they were the work of an early form of *Perrisia daphnes*, Kieff.

Double Mangel.—Messrs. Cannell and Sons, Loddon, Norwich, sent a double root of Mangel, two roots, one considerably larger than the other, being attached at about the widest part. The Committee thought it probable that the two had become grafted one on to the other during growth and following contact.

Double Daisy.—Mr. A. Worsley sent heads of a double Daisy in which several capitula had become tightly pressed together, so that the whole head presented a very curious appearance.

Glaucidium palmatum.—A Botanical Certificate was unanimously recommended for *Glaucidium palmatum* shown by Messrs. Perry, of Enfield.

Irises.—Mr. W. R. Dykes, M.A., showed a series of Irises, species of the *I. sibirica* group, all characterized by a more or less hollow stem and beardless flowers. Among them were *I. Forrestii*, *I. Wilsonii*, and *I. chrysographes*, and the following hybrids: *I.* × 'Zeta' (*sibirica* ♀ × *Wilsonii*), *I.* × 'Epsilon' (*Bulleyana* ♀ × *Forrestii*), *I.* × 'Gamma' (*Forrestii* × *chrysographes*). There were plants of the last form raised both ways, and all practically alike.

Iris tenax ♀ × *I. Wilsonii* (= *I.* × 'Meta') illustrated in a particularly striking degree the frequently-noted fact of the greater strength and vigour of a first cross over the parents. The flowers in this case had inherited a yellowish tinge from the pollen parent. *I.* × 'Iota' (*tenax* ♀ × *Purdyi*) was also shown. A peculiar colour variation in *Iris bracteata* (normally a yellow-flowered form) was also exhibited with flowers of a purplish tint, and the beautiful *I. laevigata*, so often confused with *I. Kaempferi*.

A Certificate of Appreciation was unanimously recommended to Mr. Dykes for his work in raising these Irises.

Frost Damage.—Mr. F. J. Chittenden showed Apple fruits about an inch in diameter which had been damaged by the severe frost on May 26 (at Wisley, 19° Fahr. on grass, 25° on post on the hill—probably lower in lower grounds). The flesh was in some cases only slightly-tinted brown about the vascular bundles, but in more severe attacks the cells had become greatly disorganized and the tissues broken. None of this damage was to be seen externally. The fruit on the trees on the hill had completely escaped damage, but that in the lower ground was very severely injured, although the fruits had not yet dropped.

Double Claytonia sibirica.—Mr. Chittenden also showed flowers of a double form of *Claytonia sibirica* from the Wisley Garden, in which the doubling in some cases was not confined to the petals, but three or four pistils had been produced as well (see below).

SCIENTIFIC COMMITTEE, JUNE 16, 1914.

Sir JOHN T. D. LLEWELYN, Bart., V.M.H., in the Chair, and seven members present.

Fasciated Daisy.—Mr. A. Worsley said that the fasciated daisy which he sent to the last meeting comes true from seed.

Doubling in Claytonia sibirica.—Mr. W. C. Worsdell, F.L.S., reported that he had examined the double *Claytonia* which was shown at the last meeting, and found the doubling to be due to multiple dichotomy or fasciation of the flower, *i.e.*, the flower branches into a number of equivalent secondary flowers. These are of various grades of imperfect development, possessing no calyx, and sometimes no corolla. Some of the secondary flowers consist only of a small pistil and one or two stamens, and are stalked. The branching takes place within the calyx of the primary flower, which is thus common to the whole. In some flowers almost the only abnormality consists in the presence of an extra corolla within the normal one, the whorl of five stamens being present. In others petalody of some of the stamens has occurred.

"Wild Almond" from the Cape.—Mr. W. C. Worsdell exhibited the very hairy fruits of the so-called "Wild Almond" of the Cape, *Brabejum stellulifolium*. The fruits contain a single seed, which has a flavour similar to that of the common acorn. The plant belongs to the Proteaceae.

Leaf Spots produced by Red Spider.—Mr. E. M. Holmes, F.L.S., showed foliage of *Prunus virginiana* which had been attacked by red spider, with the result that bright red spots had been produced upon it similar in appearance to those regarded as due to "burning" or sun-scorch.

Cabbage-root Maggot.—Several specimens of Brussels Sprouts,

Cauliflower, &c., from various sources were shown attacked by the Cabbage-root maggot, which appears to be very prevalent this year.

Warts on Vine-leaves.—From Lowestoft came vine foliage showing numerous small swellings on the lower surface, the result of enlargement of cells in the tissues of the leaves, following the keeping of the plants in a too close, moist, warm atmosphere.

Enlargement of Cotyledons.—Mr. F. J. Chittenden, F.L.S., showed a seedling Tomato about three months old in which the plumule and buds axillary to the cotyledons had been damaged early. He drew attention to the great increase in size and especially in thickness of the cotyledons which follows this kind of damage. He also showed a seedling of Radish about three weeks old which had been damaged by the removal of plumule and one cotyledon, in which the remaining cotyledon had enlarged to about three times the size of those on uninjured plants. In the case of the Radish a couple of apparently adventitious buds were developing about the base of the cotyledonary petiole. There was little difference in the size of the roots formed by the normal and damaged Radishes, but the root development in the case of the Tomato was slight.

Seedless Apples.—Mr. Chittenden also showed photographs of Apple ‘Duchess of Oldenburg,’ which had set in bags so that the flowers were not exposed to cross pollination, to illustrate the fact that some Apples were capable of setting seedless fruits under these conditions, while when exposed to cross pollination seed was set in the normal way.

Lesser Narcissus Fly.—Mr. Chittenden also showed a specimen of Narcissus bulb sent him by Mr. Backhouse, with a number of the larvæ of the lesser Narcissus fly feeding in the neck of the bulb under such circumstances as left little doubt that they were the originators of the attack, not merely followers feeding on damaged tissue due to some other and earlier attack.

SCIENTIFIC COMMITTEE, JULY 14, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with eight members present and Mr. F. Cuthbertson, visitor.

The late Mr. G. Gordon, V.M.H.—The Chairman announced the death of Mr. G. Gordon, who had so long been a valued member of the Committee, and it was unanimously resolved that a vote of condolence should be sent to his family.

Insects destroying Lettuce.—Mr. F. Cuthbertson showed specimens in spirit of a caterpillar which occurred in enormous numbers in the fields in California where Lettuce was growing for seed. They had apparently the same habits as the surface caterpillars in this country, and were in such abundance that five to ten acres of plants would be cleared off in a single night. The larvæ were not recognisable as British, but belong to the genus *Plusia* or a nearly allied one. Spraying with

Paris green was resorted to with success, but lead arseniate was used without benefit.

Alstroemeria Hookeri.—Mr. DuCane Godman sent flowers of an *Alstroemeria* which was introduced some years ago from Chile by Mr. H. J. Elwes, but which had not hitherto been identified. The flowers were identical in form and arrangement with those figured in Loddiges' *Botanical Cabinet*, No. 1272, under the name *Alstroemeria Hookeri*. The plant there figured was stated to be nearly 2 feet in height, but the present one rarely exceeded 1 foot.

Lysionotus Willmottiae.—This species of *Lysionotus*, shown at the Holland House Show and recommended by the Floral Committee for a Botanical Certificate, was introduced by Mr. E. H. Wilson as *Lysionotus* sp. No. 370. The plant is a dwarf shrub belonging to the *Gesneraceae*, and has Pentstemon-like flowers measuring $1\frac{1}{2}$ inch long and lilac blue. The leaves are ovate-lanceolate. The award of a Botanical Certificate was confirmed, subject to the name being a valid one. [No technical description of a plant under this name has apparently been published and the Certificate was, therefore, not awarded.]

Fruit of Harpagophytum.—Sir John T. D. Llewelyn showed a fruit of *H. procumbens*, a native of S. Africa, and known there as the Grapple Plant. He also exhibited a plant of *Primula pseudocapitata*, and made some remarks upon the change which had followed the cultivation of the plant known to gardens as *P. capitata*. *P. capitata* of gardens appears to be perennial if the seeds are removed, though if they be permitted to fruit, the plant dies.

Cladrastis amurensis.—Mr. J. Fraser, F.L.S., showed spikes of flowers of this *Cladrastis*, which, although introduced in 1880, is still rare.

Orobanche Hederae.—Mr. E. M. Holmes, F.L.S., said that two years ago he cut down an Ivy on the roots of which *Orobanche Hederae* was growing. This parasite still appeared in the same place, although no part of the aerial portion of the Ivy remained.

Nemesia with fringed flowers.—The Rev. W. Wyley, of Aysgarth, sent specimens of *Nemesia* to illustrate the following note :—"About the year 1905 the raiser had a bed of *Nemesia Suttonii* (large-flowered), bordered with *N. strumosa* (?) (dwarf), and, hoping to get a strain of blue *Suttonii*, endeavoured to fertilize white *Suttonii* with blue *strumosa* pollen; but having too little spare time and losing many seedlings through slugs, he mingled the seed of the resultant plants in 1906 with that gathered from *N. Suttonii*. During the next five years the frequent occurrence of an intermediate type (flower smaller and narrower than *N. Suttonii*) was noticed, one of which in 1910 had fringed upper petals (flowers white). In 1911 two such specimens occurred (one white, one yellow), which he interpollenized with the dark-coloured *N. Suttonii*. In 1912 again many seedlings were destroyed, but there appeared three of intermediate fringed type (one white, one yellow) and two of *Suttonii* type (a little small, but more heavily fringed, one crimson, one orange mottled). All these he interpollenized, and in 1913 about ten per cent. were heavily fringed, of various colours,

roughly twenty per cent. intermediate type slightly fringed, the rest unfringed. One of the latter bore the first flower on the lateral shoots with abnormally large lip. One fringed variety bore two of its flowers double. This year (so far as the flowers have developed) about fifty per cent. are heavily fringed, about ten per cent. scarcely fringed at all. The flowers exhibited showed a considerable amount of fringing of the upper petals."

Mr. F. J. Chittenden, F.L.S., said that recently a *Schizanthus* had been sent to him with a remarkable amount of fringing of the petals, and a common Primrose had some years ago come to his notice showing a similar development. These appeared to be instances of the sudden appearance of a new character which may have arisen owing to gametic disturbance through crossing, but they may possibly have been due to some other cause.

Dodder on German Aster.—Mr. C. E. Pearson sent some seedling German Asters thickly covered with a species of *Cuscuta*, which was unfortunately not flowering, and could therefore be no further identified. The colour of the stem was quite yellow, and very similar to that of the lucerne dodder. It had probably been introduced with foreign seed.

Seedless Pea.—For comparison with the seedless Apples shown at the previous meeting, Mr. Chittenden exhibited a pea pod about $1\frac{1}{2}$ inch in length and falcate in shape, from the variety 'William I.,' which contained no seeds and in which the ovules had apparently entirely failed to develop.

Narcissus diseases.—Mr. A. J. Bliss sent bulbs of *Narcissus*, some attacked by *Eumerus*, some not, for examination, together with notes. They were referred for examination and report at the next meeting (see below).

Indian Paint Brush.—Mrs. Longstaff sent a photograph of a beautiful species of *Castilleja* growing in her garden at Wimbledon. The seed was collected by her in the high mountains of British Columbia and sown in 1912. It germinated and was planted out in 1913, flowering this year. The species of this genus are usually apparently difficult of cultivation, for they are semi-parasitic on the roots of other plants in the same way as are the Eyebright, Louseworts; and other related plants.

SCIENTIFIC COMMITTEE, JULY 28, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with six members present, and Mr. E. A. Bunyard; visitor.

The late Mr. G. Gordon, V.M.H.—The Chairman read a letter from Mrs. Gordon thanking the Committee for their vote of condolence.

Diseased Narcissus bulbs.—Mr. F. J. Chittenden, F.L.S., reported that he had examined the *Narcissus* bulbs sent by Mr. Bliss to the last meeting and had found in every one of them bulb mites feeding in considerable numbers, and in the case of one bulb, only slightly

diseased in one scale, the mites were feeding on the limit of the decay. Larvæ of *Eumerus strigatus* were found in some only of the bulbs, and in some, but not all, fungi were growing. There were no chlamydospores of *Fusarium* present, nor was any fungus fruiting except *Penicillium*. An effort was made to get fruit of the fungi present, but *Fusarium* was not developed. No celworms were found in these examples. Mr. Chittenden said he had also examined some bulbs sent by the Rev. J. Jacob which were infested by the celworm *Tylenchus devastatrix* just as were those shown last year.

Grubs feeding on rosebuds.—Mr. Chittenden also reported that Dr. Lefroy had identified the small insects feeding on the rosebuds recently inserted as *Perrisia rosaria*. Little is known concerning this two-winged fly, but Messrs. Merrick, the senders, attribute a considerable amount of damage to its attacks.

Parasite on Magpie Moth.—Mr. E. M. Holmes, F.L.S., showed an ichneumon fly bred out from the chrysalids of *Abraxas grossulariata*, the magpie moth, at Sevenoaks. It had been identified at the British Museum as *Stenichneumon scutellata*, a very uncommon species. Mr. Holmes also showed some scale insects on Bay which await identification.

Geum 'Mrs. Bradshaw.'—Mrs. Welch, of Reigate, Surrey, sent a curious form of *Geum* with the perianth pieces green, tipped with red, about twenty in number, and separated by a considerable distance from the carpels. The flower was attacked by aphides, but whether their presence was the cause of the trouble or only a coincidence cannot be stated. Mrs. Welch said "the plant flowered beautifully and true last year; this year only blooms like the enclosed have been produced. The plant has not been moved, and appears to be perfectly healthy."

Nettle Leaf in Currants.—Affected specimens were shown by Mr. Edward A. Bunyard. He suggested that the so-called reversion is caused by the production of lateral branches, owing to some injury to the terminal bud, the Black Currant mite being probably the principal cause. A series of shoots were shown, which had been cut while in growth at different heights. Those which had been stopped at 2 inches from the base of the shoot showed laterals with the leaf reduced in size; those, however, which were stopped at some 14 inches showed the numerous lateral shoots and much cut leaves associated with this deformity. It was pointed out that the normal method of cultivation of the Black Currant consists in the production of shoots from the base, which are frequently replaced, and by this means only can large fruit be produced. If the spur system of growth is tried, the fruit in a few years will become small and worthless. Any injury which promotes the formation of these spurs will therefore result in fruit of reduced size. It was suggested by the Chairman that cuttings from the side shoots showing the deformed leaves should be taken, and if under good culture they produced normal leaves, it would confirm this view.

FRUIT AND VEGETABLE COMMITTEE.

MAY 5, 1914.

Mr. J. CHEAL in the Chair, and ten members present.

Awards Recommended :—

Award of Merit.

To Apple 'Sandlin Duchess' (votes, unanimous, subject to the tree being inspected by a deputation of the Committee), from Mr. W. Crump, V.M.H., Malvern. An excellent late variety, very similar in appearance to a large well-grown 'Cox's Orange Pippin.' Fruit round, yellow, heavily flushed with red; eye shallow; stalk short and thick. It is good for dessert and cooking.

Cultural Commendation.

To J. T. Bennett-Poë, Esq., M.A., V.M.H., London, for Lemons.

Other Exhibit.

Mrs. Denison, Berkhamsted : Onions.

FRUIT AND VEGETABLE COMMITTEE, JUNE 3, 1914.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and eight members present.

Award Recommended :—

Silver Banksian Medal.

To C. Eric Hambro, Esq. (gr. Mr. Davis), Hayes, for Melons.

FRUIT AND VEGETABLE COMMITTEE, JUNE 16, 1914.

Mr. C. G. A. NIX in the Chair, and fourteen members present.

Awards Recommended :

Gold Medal.

To Messrs. J. Veitch, Chelsea, for fruit trees in pots.

Silver-gilt Knightian Medal.

To Messrs. Barr, Taplow, for vegetables.

Silver-gilt Banksian Medal.

To Messrs. Bunyard, Maidstone, for Cherries in pots.

Silver Banksian Medal.

To Swanley Horticultural College for soft fruits packed for transit by post or rail.

Other Exhibits.

Mr. S. S. Gilbert, Pewsey : Apple ' Pride of Wilcot.'

Mrs. L. Smith, Handcross : Melon.

FRUIT AND VEGETABLE COMMITTEE, JUNE 30, 1914.

AT HOLLAND PARK.

Mr. H. SOMERS RIVERS in the Chair, and eighteen members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. cvii.]

Award Recommended :—

Cultural Commendation.

To Mr. R. Perry (gr. to Earl of Portsmouth), Whitchurch, Hants, for dishes of Cherries, ' Black Tartarian ' and ' Noir de Schmidt.'

Other Exhibit.

Messrs. Waterer & Crisp, London : Lettuce ' Wargrave Excelsior.'

FRUIT AND VEGETABLE COMMITTEE, JULY 14, 1914.

Mr. J. CHEAL in the Chair, and nine members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To M. Drummond, Esq. (gr. Mr. L. Smith), Southampton, for fruit.

Silver Knightian Medal.

To Messrs. W. Paul, Waltham Cross, for fruit trees in pots.

Bronze Knightian Medal.

To C. E. Hambro, Esq. (gr. Mr. C. Davis), Hayes, for fruit.

Other Exhibits.

T. Armstrong, Esq., Tunbridge Wells : seedling Raspberry.

Mr. H. Holden, Bath : Gooseberries.

FRUIT AND VEGETABLE COMMITTEE, JULY 28, 1914.

Mr. J. CHEAL in the Chair, and fourteen members present.

Award Recommended :—

Gold Hogg Medal.

To Messrs. J. Veitch, Chelsea, for fruit trees in pots.

Other Exhibits.

Messrs. Bide, Farnham : Cherry 'Golden Queen.'
 Messrs. Bunyard, Maidstone : Sultana Grape.
 Messrs. S. Low, Bush Hill Park : Lowberry.
 Mr. F. J. Soper, Stanmore : Potatos.
 Messrs. Spooner, Hounslow : Apples.

FRUIT AND VEGETABLE COMMITTEE, JULY 30, 1914.

SUB-COMMITTEE AT WISLEY.

Mr. C. G. A. NIX in the Chair, and seven members present.

The Sub-Committee examined the trials of Melons and French Beans and the collection of Rubi, making the following recommendations as to awards :—

First-class Certificate.

To Melons :—No. 27. 'Frogmore Scarlet,' **F.C.C.** Aug. 13, 1912.
 No. 35. 'Hero of Lockinge,' **F.C.C.** Aug. 13, 1912.
 No. 56. 'Sutton's Scarlet,' **F.C.C.** Aug. 9, 1907.
 To French Beans :—No. 5. 'Canadian Wonder (Improved),' **F.C.C.**
 Sept. 1, 1903.
 No. 8. 'Canadian Wonder (Selected),' **F.C.C.**
 Sept. 1, 1903.
 No. 19. 'Early Fortyfold.'
 No. 60. 'Perpetual,' **A.M.** July 29, 1913.

Award of Merit.

To French Beans :—Nos. 23, 24. 'Eldorado.'
 Nos. 28, 29. 'Evergreen,' **A.M.** Aug. 12,
 1909.
 No. 30. 'Excelsior,' **A.M.** Aug. 12, 1909.
 No. 41. 'Magpie.'
 No. 71. 'Sunrise,' **A.M.** July 2, 1913.

Highly Commended.

To Melon :—No. 57. 'Sentinel.'
 To French Beans :—No. 2. 'Allerfrüheste Stuttgarter.'
 No. 13. 'Dwarf Prolific' (as a pot Bean).
 No. 44. 'Mammoth Six Weeks.'
 No. 46. 'Masterpiece' (as a pot Bean).
 No. 62. 'Primo.'
 No. 64. 'Prolific Negro.'
 No. 67. 'St. Andrews.'
 Nos. 73, 74. 'Superlative.'

Commended.

To French Beans :—No. 31. 'Fillbasket.'
 No. 77. 'White Model.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 10, 1914.

SUB-COMMITTEE AT WISLEY.

Mr. W. BATES in the Chair, and two members present.

The Sub-Committee examined the trials of Melons and French Beans, making the following recommendations as to awards :—

Award of Merit.

To Melons :—No. 15. 'Duchess of York,' **A.M.** Aug. 20, 1907.

No. 22. 'Emerald Gem.'

Nos. 23, 24. 'Eminence,' **A.M.** June 25, 1907.

No. 47. 'Mymms Hero.'

No. 48. 'Perfection.'

No. 63. 'Windsor Castle.'

Highly Commended.

To Melons :—No. 5. 'Amberwood Beauty.'

No. 6. 'Barnet Hill Favourite.'

To French Beans :—No. 81. 'Climbing French.'

No. 83. 'Climbing French (re-selected).'

Commended.

To Melon :—No. 43. 'King George.'

FLORAL COMMITTEE.

MAY 5, 1914.

Mr H. B. MAY, V.M.H., in the Chair, and twenty-nine members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs B. R. Cant, Colchester, for Roses.

To Mrs Stewart Mackenzie (gr. Mr. Evans), Haywards Heath for Schizanthus.

To Messrs. J. Veitch, Chelsea, for greenhouse plants and flowering trees.

Silver Flora Medal.

To Mr. J. Box, Haywards Heath, for hardy plants.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations

To Mr. H. Burnett, Guernsey, for Carnations.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Mr. C. Engelmann, Saffron Walden, for Carnations

To Lady Paget (gr. Mr. Figgis), Kingston Hill, for *Calceolaria Chibranu*.

To Messrs. G. Paul, Cheshunt, for flowering trees and Roses.

To Messrs. Peed, West Norwood, for *Streptocarpus*.

To Messrs. Piper, Bayswater, for rockery.

To Mr. M. Prichard, Christchurch, for hardy plants.

Bronze Flora Medal.

To Mrs. Lloyd Edwards, Llangollen, for Saxifrages.

To Mr. C. Elliott, Stevenage, for rock plants.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. May, Upper Edmonton, for ferns and miscellaneous plants.

To Messrs. Phillips & Taylor, Bracknell, for alpine and Auriculas.

Bronze Banksian Medal.

To Misses Hopkins, Shepperton, for hardy plants.

To Messrs. Low, Enfield, for Carnations and Roses.

To Mr. G. Reuthe, Keston, for alpine and flowering shrubs.



FIG. 58.—*ADIANTUM GROSSUM*. (May) f. *caespit.*

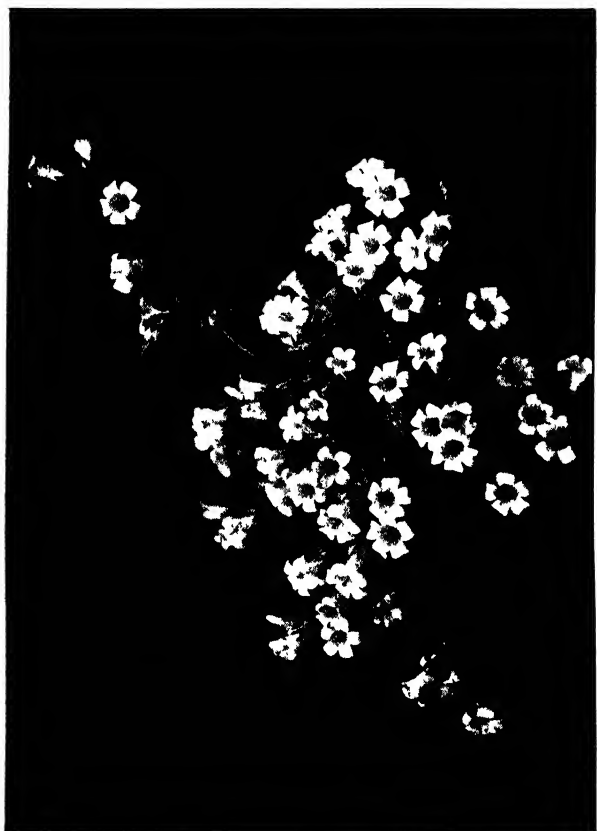


FIG. 52.—*CAMPANULA TOMENTOSA*. MAUD LANEALF. P. EXXIV.



FIG. 60 — IRIS 'GOLD CREST' (*Gardeners' Chronicle* 1p. cxxix.)



FIG. 61.—*ONALIS ADEPHOLLA* (*Gandoger, Chromola*) (p. cxxix)

First-class Certificate.

To *Rhododendron* × *Loderi* 'Diamond' (votes, unanimous), from Sir Edmund Loder, Bt. (gr. Mr. L. Apps), Horsham. This magnificent variety was raised by the exhibitor as the result of a cross between *R. Griffithianum* and *R. Fortunei*. The flowers are pure white and are broadly expanded, measuring 6 inches across. They are borne in large handsome trusses, and have cream-coloured anthers. The foliage is very large, and a fully-developed leaf measures 1 foot long by 4 inches broad.

To *Rhododendron* × *Loderi* 'Pink Diamond' (votes, unanimous), from Sir Edmund Loder, Bt., Horsham. This is identical with the preceding variety except in colour, which is a delicate pink.

Award of Merit.

To *Auricula* 'Majestic' (votes, 10 for, 5 against), from Messrs. Phillips & Taylor, Bracknell, and from Messrs. J. Veitch, Chelsea. A large chocolate maroon variety, having a deep golden-yellow eye. It appears to be free-flowering in habit and of strong constitution.

To *Iris* 'Isolda' (votes, 20 for), from Mr. C. G. van Tubergen, jun., Haarlem. This and the succeeding variety are charming additions to the *Regelia*-*Cyclus* group of Irises which have been obtained by crossing the *Regelia* and the *Oncocyclus* groups. The flowers of this variety are of medium size, with standards measuring 2 inches across. The colour is light bronze, which becomes lighter towards the margins. On closely inspecting the flower it is seen that the bronze colour effect is given by the delicate dark plum-violet veining, which overlays a dull amber-yellow ground. The falls are heavily and darkly blotched. This variety is darker and broader than 'Charon,' which is already well known and is somewhat similar in colour.

To *Iris* 'Leucothea' (votes, 18 for), from Mr. C. G. van Tubergen, jun., Haarlem. The flowers of this variety are large and of a lilac-violet colour. The standards and falls are broad, and the latter are heavily veined and blotched with deep purple.

To *Rhododendron* 'Gill's Goliath' (votes, unanimous), from Messrs. Gill, Falmouth. A very charming variety, bearing large trusses of bright carmine-pink flowers, measuring 3½ inches across. The colour becomes lighter towards the base, and the anthers are light brown. The leaves are lanceolate and leathery.

To *Syringa reflexa* (votes, 16 for, 2 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A new hardy Lilac raised from seeds sent from China by Mr. E. H. Wilson, V.M.H. The flowers are pale rose pink in colour, and are borne in tapering crowded panicles about 6 inches long. The four lobes of the corolla are much paler than the tube. The leaves are pale green, ovate, deeply veined, and measure about 6 inches long by 3 inches broad. The characteristic scent of *Syringa vulgaris* and its varieties appears to be absent from this species.

Other Exhibits.

- Messrs. Backhouse,*York : *Saxifraga* 'Wenlock Best of All.'
 Messrs. Bunyard, Maidstone : alpinæ.
 Messrs. Cheal, Crawley : trees and shrubs.
 Messrs. Clark, Dover : hardy plants.
 Messrs. Cole, Swanley : Pelargoniums.
 Messrs. Gilbert, Bourne : Anemones.
 Guildford Hardy Plant Nursery, Guildford : hardy plants.
 Mr. H. Hemsley, Crawley : hardy plants.
 Messrs. Jackman, Woking : hardy plants.
 John Innes, Horticultural Institution, Merton : Calceolarias.
 Mr. G. Kerswill, Exeter ; Gentians.
 Elizabeth, Lady Lawrence, Dorking : *Lathyrus pubescens*, **A.M.** 1903.
 C. J. Lucas, Esq., Horsham : *Distylium racemosum*, *Paulownia imperialis*, *Plagianthus betulinus*, *Ribes speciosum*, and *Sophora tetraptera*, all cut from the open.
 Miss Mangles, Farnham : Rhododendrons.
 J. E. Maunder, Esq., Warkworth : *Primula denticulata*.
 Mr. G. W. Miller, Wisbech : hardy plants.
 Messrs. Carter Page, London : Violas and annuals.
 Rev. J. Pemberton, Romford : Rose 'Pemberton's White Rambler.'
 Mr. A. Perry, Enfield : hardy plants.
 Mr. R. Prichard, West Moors : alpinæ.
 Messrs. Reamsbottom, Geashill : Anemones.
 Sir H. B. Robertson, Corwen : *Primula* 'Jean.'
 Mr. L. R. Russell, Richmond : hardy plants.
 Messrs. Tucker, Oxford : alpinæ.
 Mrs. C. Molesworth Tuke, Chiswick : pink Lily of the Valley.
 Messrs. Ware, Feltham : hardy plants.
 Messrs. Waterer & Crisp, London : alpinæ and shrubs.
 Messrs. Wells, Merstham : Antirrhinums and Carnations.
 Miss E. Willmott, F.L.S., Great Warley : *Rhododendron warleyense*,
R. Willmottiae, and *Androsace Henryi*.
 Messrs. Wills & Segar, Kensington : greenhouse plants.

FLORAL COMMITTEE, MAY 19, 1914.

AT CHELSEA.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. xcvi.]

Awards Recommended :—

First-class Certificate.

To *Adiantum grossum* (votes, unanimous), from Messrs. H. B. May, Upper Edmonton. A very beautiful fern from tropical America.

The graceful fronds have large ear-shaped pinnules, which are prettily bronzed when young, but later become pale green. The plant reaches an average height of 1 foot, and it has the appearance of a giant erect form of *A. lunulatum*. (Fig. 58.)

Award of Merit.

To *Adiantum gloriosum Lemkcsii* (votes, 9 for), from Messrs. Lemkes, Alphen, Holland. A charming *Adiantum* derived from *A. scutum roseum*. The fully-matured fronds bear large, pale pea-green pinnules, prettily crenated and crinkled. The chief beauty of this fern lies in the beautiful pale salmon-bronze tint of the young fronds.

To *Begonia* 'Lady Carew' (votes, 8 for, 3 against), from Messrs. Blackmore & Langdon, Bath. A very fine double variety. The flowers are large and of a very bright cerise-pink colour. The foliage is of medium size, and dark green in colour.

To *Calceolaria Stewartii* (votes, 10 for), from Messrs. J. Veitch, Chelsea. An excellent compact variety for bedding purposes. It is of American origin, and grows slightly over 1 foot high. The flowers are deep golden-yellow in colour, and are borne in large trusses. The leaves are dark green, ovate and serrate.

To *Campanula tomentosa* 'Maud Landale' (votes, unanimous), from Miss Landale, Limsfield, Hants. A very distinct and beautiful rock plant, producing very freely its pale lilac-violet tubular flowers in trailing racemes, which measure 8 inches to 1 foot in length. The flowers measure $\frac{3}{4}$ inch long, and their calyces are hairy. The stems are also hairy and of a reddish-brown colour. The leaves are small cordate, tomentose, crenulate, and the petioles measure about 2 inches in length. (Fig. 59.)

To Carnation 'Scarlet Carola' (votes, 7 for, 3 against), from Mr. C. Engelmann, Saffron Walden. This excellent variety has the well-known form and size of 'Carola,' is scarlet in colour, and possesses a beautiful clove scent. The calyx is good and does not split.

To *Clematis* 'Empress of India' (votes, 9 for), from Messrs. Jackman, Woking. A good variety, of strong constitution, raised as the result of a cross between *C.* 'Fairy Queen' and *C.* 'Ville de Lyon.' It is intermediate between the two parents in size and colour. The latter is a shade of mauve, tinged with cerise, and is quite a new colour in this section of *Clematis*.

To *Iris* 'Gold Crest' (votes, 7 for, 2 against), from W. R. Dykes, Esq., M.A., Godalming. A lovely pale violet variety, obtained by crossing *I. pallida* and *I. Cengialti*. The flowers are of medium size, and the standards and falls are broad. The latter measure 2 inches across, and the conspicuous beard is deep golden yellow. (Fig. 60.)

To *Oxalis adenophylla* (votes, 5 for), from Messrs. Bees, Liverpool, and Mr. G. Reuthe, Keston. A hardy species from Chile, bearing rose-pink flowers. The leaves are small, obcordate, and glaucous. (Fig. 61.)

To *Pinguicula Reuteriana* (votes, 7 for, 1 against), from Mr. G. Reuthe, Keston. The flowers of this beautiful bog plant are pink,

with rose lines on the inside of the throat. The leaves are pale green, ovate, and the height of the plant is from 4 inches to 6 inches. A rare and local plant from the Jura.

To *Pittosporum* 'Silver Queen' (votes, 6 for, 1 against), from Mr. J. Coey, Donard Nursery, Newcastle, Co. Down. This very handsome foliage shrub is a sport from *P. Mayi*. It has very pale green foliage, with a narrow, irregular, whitish margin. The young bark is chocolate brown in colour.

To *Platyserium Cordreyi* (votes, 9 for), from Messrs. May, Upper Edmonton. A very fine form of *P. alcorni*, growing to the height of 2½ feet. The beautiful erect fertile fronds are covered with white tomentum, and in form are intermediate between those of the type and *P. Veitchii*.

To *Primula secundiflora* (votes, unanimous), from Messrs. Bees, Liverpool. A new hardy species, introduced from China in 1911. The flowers are of a deep rose colour and are borne in large heads. They are slightly pendulous, and their calyces are farinose. The leaves are long and narrow. (Fig. 62.)

To *Pteris flabellata plumosa* (votes, unanimous), from Messrs. May, Upper Edmonton. A very plumose form of the South African *Pteris* (*P. flabellata*). The graceful arching fronds are almost lace-like in form, and are pale green in colour.

To *Teloepa speciosissima* (votes, unanimous), from Rev. A. T. Boscawen, Ludgvan Rectory, Long Rock, Cornwall. Although this beautiful and very uncommon evergreen shrub was introduced from the Blue Mountains of New South Wales as long ago as 1789, it has very rarely been seen in flower in England. The deep crimson, tubular flowers are about 1 inch long, and are borne in a dense globular head surrounded by an involucre of ovate-lanceolate blood-red bracts, each measuring from 2 to 3 inches in length. The firm leathery leaves are cuneate-oblong in shape, and measure about 6 inches long by 1½ inch broad. They are toothed in the upper part, and are dark green above and paler below. (Fig. 63.)

Cultural Commendation.

To Rev. A. T. Boscawen, Ludgvan Rectory, Long Rock, Cornwall, for *Teloepa speciosissima*.

Other Exhibits.

Mr. G. C. Addy, Ightham : *Dianthus neglectus* 'Vivid' and Violetta 'Slieve Donard.'

Prof. I. B. Balfour, V.M.H., Edinburgh : *Meconopsis rudis*, *Primula dryadifolia*, *Saxifraga chionophila*, *S. oranensis*, and *S. pentadactylis*.

Messrs. Bide, Farnham : Sweet Peas.

Mr. A. J. Bruce, Manchester : *Sarracenia*s.

Mr. J. A. Cooper, Sligo : *Primulas*.

Mr. J. Crouch, Lower Edmonton : *Roses*.

W. G. Daffarn, Esq., London : *Rhododendrons*.

- Messrs. A. Dickson, Newtownards : Roses.
- Capt. A. A. Dorrien-Smith, D.S.O., Berkhamsted : *Pimelea microcephala*.
- Mr. J. Douglas, Great Bookham : Carnations.
- Mr. C. Elliott, Stevenage : Aubrietia 'Mikado,' and *Erysimum linifolium*.
- Mr. J. Elliott, Hurstpierpoint : *Asparagus virgatus elegans*, *A. plumosus formosus*.
- Mr. T. R. Hayes, Keswick : *Polemonium carneum*.
- Messrs. Hill, Lower Edmonton : *Asplenium planicaule pendens*.
- Messrs. Kelway, Langport : *Anchusa italica* 'Mrs. Jas. Kelway' and Pyrethrums.
- Messrs. M. Koster, Boskoop, Holland : Azaleas.
- Messrs. Ladhams, Southampton : *Erigeron hybridus* 'B. Ladhams.'
- Messrs. S. Low, Enfield : *Verbena chamacdryoides*, Hydrangea 'Madame Mouillière Improved,' *Erica Bergiana glauca*.
- J. Macwatt, Esq., Duns : *Primula Gammieana*.
- Miss Mangles, Farnham : Rhododendrons.
- Mr. G. W. Miller, Wisbech : hardy plants.
- Messrs. Münch & Haufe, Dresden : Rose 'Betsy van Nes.'
- Mr. R. C. Notcutt, Woodbridge : Azaleas, &c.
- Messrs. W. Paul, Waltham Cross : Roses.
- Mr. A. Perry, Enfield : hardy plants.
- Messrs. Piper, Bayswater : *Corydalis tomentosa*.
- Mr. A. Prichard, West Moors : alpines.
- Mr. W. Profitlich, Twickenham : Astilbes.
- Mr. L. R. Russell, Richmond : Rhododendron 'Mrs. L. R. Russell.'
- J. Scruby, Esq., Bishop's Stortford : Asparagus.
- Messrs. Thompson & Charman, Bushey : *Senecio aurantiaca hybrida*.
- Mr. W. P. Voet, Haarlem : Irises.
- Messrs. Wallace, Colchester : *Wistaria sinensis* fl. pl.
- Messrs. Waterer & Crisp, London : Tulip 'Marconi' and *Campanula Allionii*.
- W. Whitaker, Esq., Lymington : *Primula* 'Pylewell Hybrid.'
- Miss Willmott, V.M.H., Great Warley : *Veronica prostrata* 'Warley Blue.'

FLORAL COMMITTEE, JUNE 3, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—**Gold Medal.**

To Messrs. Dobbie, Edinburgh. for Sweet Peas and Antirrhinums.

Silver-gilt Banksian Medal.

- To Messrs. Barr, Covent Garden, for hardy plants.
- To Mr. J. Box, Haywards Heath, for hardy plants.
- To Messrs. B. R. Cant, Colchester, for Roses.
- To Messrs. A. Dickson, Newtownards, for Sweet Peas.
- To Mr. A. Perry, Enfield, for Poppies, &c.

Silver Flora Medal.

- To Messrs. Bath, Wisbech, for Sweet Peas and Tulips.
- To Mr. H. Burnett, Guernsey, for Carnations.
- To Messrs. F. Cant, Colchester, for Roses.
- To Messrs. Cuthbert, Southgate, for greenhouse plants.
- To Mr. J. Douglas, Great Bookham, for Carnations.
- To Mr. E. J. Hicks, Twyford, for Roses.
- To Messrs. E. W. King, Coggeshall, for Sweet Peas.
- To Messrs. Waterer, Sons, & Crisp, London, for Rhododendrons, Irises, &c.

Silver Banksian Medal.

- To Messrs. Bide, Farnham, for Sweet Peas.
- To Messrs. Cannell, Eynsford, for Roses.
- To Messrs. May, Upper Edmonton, for miscellaneous plants.
- To Messrs. Phillips & Taylor, Bracknell, for bog and water garden.
- To Messrs. Wallace, Colchester, for Irises.

Bronze Flora Medal.

- To Mr. C. Engelmann, Saffron Walden, for Carnations.
- To Messrs. Kelway, Langport, for Paeonies, &c.
- To Mrs. Litkie (gr. Mr. Hulbert), Maidenhead, for Calceolarias.
- To Messrs. Low, Enfield, for Carnations.

Bronze Banksian Medal.

- To Messrs. Clark, Dover, for hardy plants.
- To Messrs. Godfrey, Exmouth, for Poppies, &c.
- To R. Keep, Esq. (gr. Mr. Pym), North Cray, for Clarkias.
- To Messrs. Carter Page, London, for Dahlias, Violas, &c.
- To Messrs. Peed, Norwood, for Gloxinias and Streptocarpus.
- To Mr. G. Reuthe, Keston, for hardy plants.
- To Mr. L. R. Russell, Richmond, for greenhouse plants.
- To Messrs. Ware, Feltham, for hardy plants.

Award of Merit.

To Dobbie's strain of Antirrhinums (votes, 10 for), from Messrs. Dobbie, Edinburgh. An excellent strain of Intermediate Antirrhinums, averaging about 20 inches in height. The flowers are very large, and are borne in good bold spikes, while the colours range from white to crimson, and include many beautiful shades of yellow and orange. Some of the best named varieties are: 'Amber Queen,' 'Maize Queen' (maize yellow shaded salmon), 'Moonlight' (apricot), 'Primrose King' and 'Yellow Queen.'

To Mrs. Scott-Elliott's strain of *Aquilegias* (votes, unanimous), from Mrs. Scott-Elliott, Teviot Lodge, Hawick. After working for over fifty years, this exhibitor has obtained what is probably the most beautiful strain of long-spurred *Aquilegias* in cultivation. The flowers are large, and vary in colour through charming shades of cream, pink, lavender, blue, white, and red.

To Carnation 'Mrs. Griffith Jones' (votes, 10 for), from Mr. J. Douglas, Great Bookham. A distinct and beautiful apricot self border variety with smooth petals.

To Carnation 'Mrs. Brotherstone' (votes, 16 for), from Mr. J. Douglas, Great Bookham. A good white-ground border variety, heavily suffused and dotted with crimson, and possessing a very strong clove scent.

To Carnation 'Robert Bruce' (votes, 7 for, 3 against), from Mr. J. Douglas, Great Bookham. A very fine orange-salmon border variety, of good size and substance.

To *Clematis Sieboldii* (votes, 14 for, 1 against), from Miss Willmott, F.L.S. (gr. Mr. Fielder, V.M.H.), Great Warley. A very pretty hardy climber introduced from Japan by Dr. Siebold, after whom it is named. The six ovate acute sepals, each measuring about $1\frac{3}{4}$ inch long, are amber-white in colour, and contrast pleasingly with the violet-blue central mass of modified stamens, which measures about $1\frac{1}{2}$ inch across. The leaves are ternate, with lobed leaflets. (Fig. 64.)

To *Deutzia discolor elegantissima* (votes, unanimous), from Elizabeth, Lady Lawrence (gr. Mr. Bain), Dorking. A beautiful dwarf shrub growing about 2 feet high, and producing gracefully arching branches bearing axillary corymbose bunches of 20 or more lilac-pink flowers, each measuring $\frac{3}{4}$ inch in diameter.

To *Erigeron hybridus* 'B. Ladhams' (votes, 14 for, 2 against), from Messrs. Ladhams, Shirley, Southampton. An interesting seedling from *E. aurantiacus* of stiff erect habit. The flowers measure about $1\frac{1}{2}$ inch across and are mauve-pink in colour. The height of the plant is about 2 feet.

To *Iris chrysographes* (votes, unanimous), from W. R. Dykes, Esq., M.A., Godalming and Miss Willmott, F.L.S., Great Warley. A beautiful species introduced in 1908 from S.W. China by Mr. E. H. Wilson, V.M.H. The flowers are deep violet-purple in colour, with a central line of gold on the long, hanging falls, and a few dots of the same at the throat. The plant grows about $2\frac{1}{2}$ feet high and has grassy foliage.

To *Iris* 'Iota' (votes, 15 for, 2 against), from W. R. Dykes, Esq., M.A., Godalming. A very beautiful hybrid between *I. tenax* and *I. Purdyi*. The seed was sown in 1910, and one plant at the time of exhibiting was bearing forty-two flower spikes. The flowers are of a white ground-colour, charmingly shaded and veined with pale lilac-mauve. They are borne two on a stem. The standards are erect and lanceolate, while the falls are oblong-cuneate and the foliage is long, narrow, and arching.

To *Iris* 'Kashmir White' (votes, 11 for, 1 against), from Messrs. Wallace, Colchester. A very fine seedling from *I. kasmiriana*, growing 3-4 feet high, and bearing six large pure white flowers on a stem. This variety was raised by the late Sir Michael Foster. (Fig. 65.)

To *Iris lacvigata alba* (votes, unanimous), from Messrs. Wallace, Colchester. This is the white form of the true *I. lacvigata*. The flowers have a faint shading of mauve at the throat, and the height of the plant is about 18 inches.

To *Iris sibirica* 'Emperor' (votes, 14 for 1 against), from Messrs. Wallace, Colchester. A very fine form of *Iris sibirica*, having deep violet-blue flowers with large circular falls. The white patch at the throat of the type is absent in this variety. The plant is erect in habit and much taller than the type.

To *Lupinus arboreus* 'Primrose Dame' (votes, 14 for, 3 against) from Messrs. Barr, Taplow. A beautiful seedling from *L. arboreus* having long spikes of pale primrose-yellow flowers.

To Barr's strain of *Lupinus polyphyllus* (votes, unanimous), from Messrs. Barr, Taplow. An excellent strain, comprising varying shades of white, lavender, mauve, blue, and purple. Some of the best named varieties, such as 'Nellie,' 'The Bride,' 'Dainty,' and 'Beauty,' were obtained as the result of crosses between *L. polyphyllus* and *L. arboreus*.

To *Mimulus* 'Wargrave Fireflame' (votes, unanimous), from Messrs. Waterer, Sons, & Crisp, London. An excellent plant for damp situations. It grows about 6 inches in height, and bears large, deep, fiery-red flowers, having a yellow throat.

To *Papaver orientale* 'Lady Frederick Moore' (votes, 12 for, 4 against), from Mr. A. Perry, Enfield. A large pale salmon-pink variety, having dark blotches at the base of the petals. The flowers are borne on stout erect stems.

To *Ribes Brocklebankii* (votes, 9 for, 1 against), from Elizabeth, Lady Lawrence (gr. Mr. Bain), Dorking. A very pretty form of *R. alpinum*, with bright yellow foliage. The plant is hardy and grows slightly over 1 foot in height.

To *Verbascum* 'Warley Rose' (votes, unanimous), from Miss Willmott, F.L.S. (gr. Mr. Fielder, V.M.H.), Great Warley. A very beautiful herbaceous plant, growing from 4 to 5 feet high. The flowers are borne in a branched panicle and are of a lovely old rose colour. The medium-sized leaves are borne in a flat rosette at the base of the plant. (Fig. 66.)

Other Exhibits.

Mr. J. Anderson, Clacton-on-Sea : Pelargonium.

Miss Bayne, Bridge of Allan : Clematis.

Mr. C. Blick, Hayes : Carnations.

Messrs. Brown, Peterborough : hardy plants.

Mr. B. Bussey, Thetford : Carnations.

Mr. C. W. Chantler, St. Mary Cray : Irises, &c.

Messrs. Cheal, Crawley : flowering shrubs.



FIG. 62.—*PRIMULA SECUNDFLORA* (p. CXXX)

Plate p. CXXX



FIG. 63. *PELOPEA SPECIOSISSIMA* (Gardner's Chronicle) (p. CXXX)

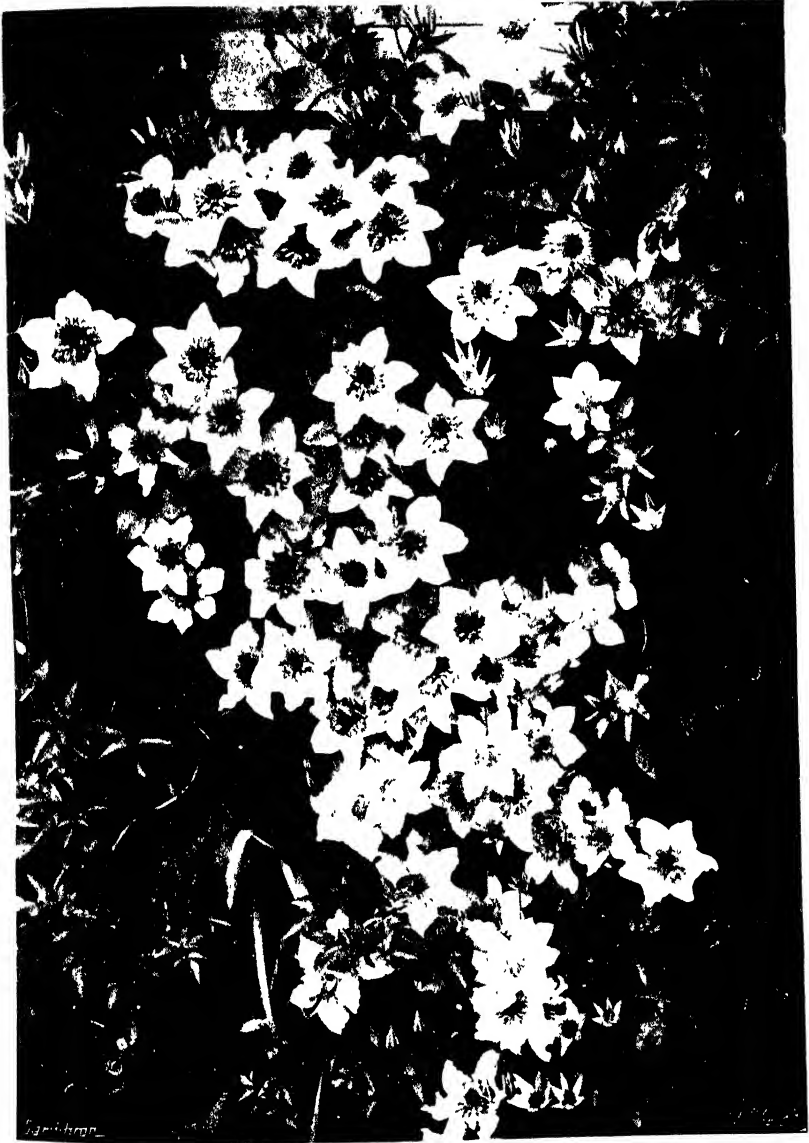


FIG. 61. CLEMATIS STROBILACEA (Gardener's Chronicle) (P. 555811)



FIG. 65.—IRIS 'KASHMIR WHITE'. (*Gardener's Chronicle*,
1898, p. 100.)

- Sir Mark Collet, Bt., Sevenoaks : Clematis.
 Messrs. Cutbush, Highgate : greenhouse plants, alpine, &c.
 Mr. C. Elliott, Stevenage : alpine.
 Messrs. Gilbert, Bourne : Anemones.
 Messrs. Grove, Sutton Coldfield : *Saxifraga lantoscana rosea*.
 F. C. Hill, Esq., Sandown : Primulas.
 Misses Hopkins, Shepperton : hardy plants.
 Messrs. Jackman, Woking : hardy plants.
 John Innes Horticultural Institution, Merton : *Calceolaria plantaginea* × *C. polycorolla*.
 Mr. G. W. Miller, Wisbech : hardy plants.
 Mr. G. Prince, Longworth : Roses.
 Mr. W. Profitlich, Twickenham : Astilbes.
 Mr. A. Langley Smith, Catford : hybrid Pelargoniums.
 Messrs. J. Veitch, Chelsea : hardy plants.
 Messrs. Wells, Merstham : Antirrhinums.
 A. Worsley, Esq., Isleworth : vars. of *Phyllocactus* × *Coopermannii*.

FLORAL COMMITTEE, JUNE 16, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-nine members present.

Awards Recommended :—*Silver-gilt Flora Medal.*

To Messrs. B. R. Cant, Colchester, for Roses.

Silver-gilt Banksian Medal.

To G. Ferguson, Esq. (gr. Mr. F. W. Smith), Weybridge, for Delphiniums.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Pæonies.

To Mr. J. Box, Haywards Heath, for hardy plants and Sweet Peas.

To Mr. H. Burnett, Guernsey, for Carnations.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. Kelway, Langport, for hardy plants.

To Messrs. May, Upper Edmonton, for standard flowering plants.

To Mr. A. Perry, Enfield, for hardy plants.

To Messrs. Smith, Woodbridge, for hardy plants.

Silver Banksian Medal.

To Messrs. Barr, Taplow, for hardy plants.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.

To Mr. C. Engelmann, Saffron Walden, for Carnations

To Messrs. Jackman, Woking, for hardy plants.

To Messrs. S. Low, Bush Hill Park, for Roses and Carnations.

To Messrs. G. Paul, Cheshunt, for Roses.

To Mr. M. Prichard, Christchurch, for hardy plants.

- To Mr. G. Reuthe, Keston, for hardy plants.
- To Mr. L. R. Russell, Richmond, for hardy plants.
- To Messrs. Wallace, Colchester, for hardy plants.
- To Messrs. Ware, Feltham, for Pæonies and Irises.
- To Messrs. Waterer, Sons, & Crisp, London, for hardy plants.

Bronze Flora Medal.

- To Messrs. Tucker, Oxford, for alpiners.
- To Messrs. J. Veitch, Chelsea, for *Elaeocarpus reticulatus*. **F.C.C.**

1912.

Bronze Banksian Medal.

- To Messrs. Bunyard, Maidstone, for Pæonies.
- To Messrs. Cutbush, Highgate, for greenhouse plants.
- To Mr. E. Hicks, Twyford, for Roses.
- To Mr. V. T. Hill, Bristol, for alpiners.
- To Lissadell Nursery, Sligo, for Primulas.
- To Messrs. Piper, Bayswater, for hardy plants.
- To Messrs. Thompson & Charman, Bushey, for hardy plants.

Award of Merit.

To Carnation 'Bedford Belle' (votes, unanimous), from Messrs. Laxton, Bedford. A perpetual-flowering variety, bearing medium-sized flowers of perfect form. The colour is bright salmon-pink, and the petals are prettily crinkled. The centre of the flower is very full, and the calyces are non-splitting. Not the least pleasing feature of this variety is its strong clove scent. The flower stems are very stiff, and the plant appears to possess a vigorous constitution.

To Carnation 'Scarlet Glow' (votes, 10 for, 2 against), from Mr. C. Blick, Hayes. A large, smooth-petalled border variety, with a good calyx but no scent. The colour is scarlet-carmine, and the flower stems are rather weak.

To Delphinium 'Henri Moissan' (votes, 12 for, 3 against), from Messrs. Blackmore & Langdon, Bath. A good variety, producing bold spikes of deep violet-purple, semi-double flowers, with dark eyes. The length of the flower spike is about 2 feet.

To Pæony 'Golden Harvest' (votes, 17 for, 4 against), from Messrs. Bath, Wisbech. This is an American variety, with very large full flowers measuring $7\frac{1}{2}$ inches across. The centre is creamy white, while the outer segments are pale lilac-rose. The plant is said to be very free in blooming, and the flowers last well when cut.

To *Polystichum munitum undulatum* (votes, 13 for, 3 against), from Mr. G. Fraser, Ucluelet, British Columbia. A beautiful undulated form of the hardy fern *Polystichum munitum*. It was found occurring wild near the home of the exhibitor. The fronds measure about 15 inches long, and the pinnæ are slightly twisted. The colour is dark green above and very pale green below. The plant is not quite so erect in habit as the type.

To Rose 'J. F. Barry' (votes, 16 for), from Mr. G. W. Piper, Uckfield. A charming sport from Rose 'Arthur R. Goodwin.' The flowers are medium in size, strongly scented, and of good form. The colour is a beautiful clear yellow, though the buds are sometimes slightly tinged with pink. The plant is claimed to be a perpetual bloomer and of dwarf bushy habit.

To Rose 'Princess Mary' (votes unanimous), from Mr. E. Hicks, Twyford. A very beautiful single H.T. variety, bearing large dark crimson flowers with golden anthers. This rose is very beautiful in bud and is sweetly scented. It is said to be dwarf in growth and perpetual-flowering in habit.

To *Silene alpestris grandiflora fl. pl.* (votes unanimous), from Mr. G. Reuthe, Keston, and Messrs. Tucker, Oxford. A beautiful dwarf and compact alpine plant, bearing profusely its double white flowers, measuring slightly over $\frac{1}{2}$ inch across and having toothed petals. The height of the plant is about 4-5 inches, and the rather scanty short lanceolate leaves are pale green in colour. (Fig. 67.)

To Sweet Pea 'Dobbie's Orange' (votes, 11 for, 2 against), from Messrs. Dobbie, Edinburgh. A very deep orange variety, with prettily waved standard. The blooms are borne mostly in threes.

To Sweet Pea 'Robert Sydenham' (votes unanimous), from Mr. T. Stevenson, Addlestone. This is an excellent variety in every respect. The flowers are large, bright reddish orange in colour, waved, and are borne mostly in threes on exceptionally strong stems.

To Sweet Pea 'Royal Purple' (votes, 11 for, 3 against), from Messrs. Dobbie, Edinburgh. A very fine, distinct purple variety. The flowers are very large, and are borne in fours on long, stout stems.

Cultural Commendation.

To Mr. G. Reuthe, Keston, for *Celmisia Monroi*. **F.C.C.** 1897.

Other Exhibits.

W. T. Barneby, Esq., Bromyard : white *Anchusa*.

Miss Bayne, Bridge of Allan : *Clematis*.

Mrs. Berkeley, Worcester : *Hydrangea* 'Spetchley.'

Mr. W. Brooks, Weston-super-Mare : *Lobelia* 'Butterfly.'

Miss Chambers, Fishguard : *Beschorneria yuccoides*.

Col. S. R. Clark, C.B., Cuckfield : *Gladiolus Buettneri*.

Messrs. Clark, Dover : hardy plants.

Miss Debenham, St. Albans : *Viola* 'Spencer Pea.'

Mr. J. H. Dines, Moreton-in-Marsh : *Calceolaria*.

Mr. W. Easlea, Leigh-on-Sea : *Roses*.

Mrs. Hermon, Balcombe : *Lobelia* 'White House Blue.'

Misses Hopkins, Shepperton-on-Thames : hardy plants.

Mr. H. Howard, Purfleet : *Lilium*.

Mr. G. Kent, Dorking : *Carnation* 'Frank Kent.'

Mr. G. W. Miller, Wisbech : *Pyrethrum* 'G. W. Miller' and *Achillea* 'King Alfred.'

Messrs. O'Neill & Snowden, Olveston : Rose 'Florence O'Neill.'

Messrs. Carter Page, London : Dahlias and Pelargoniums.
 Mrs. L. Powles, Rye : Viola 'Rye Rayless.'
 Mr. C. Thomas, Exeter : *Meconopsis aculeatus*.
 Mr. E. A. Turner, Enfield : Violas.
 Mr. J. T. West, Brentwood : abnormal Geum 'Mrs. Bradshaw.'
 Messrs. Wheadon, Guernsey : Gladiolus 'Sarnia's Glory.'
 Messrs. Wills & Segar, Kensington : Hydrangeas.

FLORAL COMMITTEE, JUNE 30, 1914.

AT HOLLAND PARK.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. cvii.]

Awards Recommended :—

First-class Certificate.

To *Hypericum laeae rubrum* (votes unanimous), from Messrs. Bees, Liverpool. A very distinct and beautiful shrubby *Hypericum* from Asia Minor, bearing numerous corymbs of deep orange-red flowers. The leaves are linear and about 1 inch long. The individual flowers are about $\frac{1}{2}$ inch in diameter, and have golden-yellow anthers. The plant grows about 18 inches high and is said to be hardy.

Award of Merit.

To *Amaranthus* 'Dr. Martin' (votes, 9 for, 1 against), from Mr. W. B. Upjohn, Worsley Gardens, Manchester. A beautiful and effective decorative foliage plant for the cool stove-house. The young leaves are reddish carmine, while the older ones are deeply bronzed from the tip for about two-thirds of their length.

To *Campanula garganica* 'W. H. Paine' (votes, 9 for, 1 against), from Messrs. W. Watson, Clontarf Nurseries, Dublin. A charming alpine *Campanula*, especially suitable for cultivation in pans. The spreading growths are covered with pale violet-blue, star-shaped flowers, measuring $\frac{3}{4}$ inch across and having white centres. The foliage is similar to that of the type. (Fig. 68.)

To Carnation 'Chelsea' (votes unanimous), from Mr. A. F. Dutton, Iver. A white-ground fancy tree variety, edged and splashed with deep rose-pink. The flower is very full, of good form, and has a good calyx.

To Carnation 'Gordon Douglas' (votes unanimous), from Mr. J. Douglas, Great Bookham. An excellent border variety, of good form, with smooth petals. The colour is dark crimson, and the flowers are borne on good stiff stems.

To Gladiolus 'Mrs. Atkinson' (votes, 7 for, 2 against), from Mr. C. B. Blampied, Guernsey. A good early flowering variety bearing

beautiful salmon-pink flowers, the lower petals of which are blotched with carmine.

To *Gladiolus* 'Radiance' (votes, 12 for), from Messrs. Wheadon Guernsey. Another early-flowering variety, having deep fiery, orange flowers. The lower petals are somewhat deeper in colour, and are marked with crimson-tinged blotches. The spike of flowers is about 1 foot long.

To *Iris Kaempferi* 'Mikado' (votes, 9 for, 1 against), from Messrs. Wallace, Colchester. A fine and vigorous variety of the Japanese Iris. The fully-expanded blooms measure $7\frac{1}{2}$ inches across. The ground-colour is white shaded with lilac-violet, and the standards are bright rose.

To Rose 'Waltham Scarlet' (votes, 9 for), from Messrs. W. Paul, Waltham Cross. A fragrant single H.T. variety, of very free flowering habit. The flowers measure slightly over 3 inches across, and are of a reddish-carmine shade, which contrasts pleasingly with the central mass of golden-yellow stamens.

To Sweet Pea 'Mrs. Hugh Wormald' (votes, 10 for, 1 against), from Messrs. Hobbies, Dereham. A very distinct and pleasing bicolor variety, raised as the result of a cross between 'Elsie Herbert' and 'Sunproof Crimson.' The wings and keel are cream, while the waved standard is of a pretty pink shade. The flowers are borne mostly in threes.

To Sweet Pea 'The President' (votes, 10 for), from Messrs. A. Dickson, Belfast. A very fine deep orange variety, with carmine shaded wings and waved standard. The flowers are carried mostly in threes on strong stems.

Other Exhibits.

W. Arkwright, Esq., Chesterfield : Violas, &c.

R. V. Berkeley, Esq., Worcester : *Hydrangea* 'Spetchley.'

Messrs. Blackmore & Langdon, Bath : *Begonias* and *Delphiniums*.

Messrs. Clark, Dover : *Delphiniums* &c.

Messrs. Cutbush, Highgate : *Pelargonium* 'Radiance.'

Mr. H. J. Damerum, Hayling Island : Sweet Peas.

Messrs. H. Dickson, Belfast : Roses.

Messrs. Dobbie, Edinburgh : Sweet Pea 'Alfred Watkins.'

W. S. Edwardson, Esq., Sidcup : *Begonia* 'Mrs. W. S. Edwardson.'

Mr. A. Ll. Gwillim, Sidcup : *Begonias*.

Mr. H. Hemsley, Crawley : *Dorycnium hirsutum* and *Verbena chamaedryoides*.

Messrs. Kelway, Langport : Carnation 'Ella Kelway.'

Mrs. Myles Kennedy, Ulverston : *Gloriosa*.

Messrs. E. W. King, Coggeshall : Sweet Peas.

Messrs. Ladhams, Southampton : hardy plants.

Messrs. Lane, Berkhamstead : Rose 'Lane's Parterre.'

Mr. W. A. Manda, St. Albans : *Tradescantia multicolor*, *Nephrolepis Millsii*, and *N. tuberosa plumosa*.

Mr. G. W. Miller, Wisbech : *Achilleas*.

Messrs. G. Paul, Cheshunt : Rose 'Astrea.'

P. Shelley, Esq., Chislehurst : *Anchusa italica* 'Pearl.'

Messrs. Sydenham, Birmingham : Sweet Pea 'Norvic.'

Messrs. Ware, Feltham : Begonias.

Messrs. Waterer & Crisp, London : Eremuri.

Mr. W. Wells, jun., Merstham : Delphinium 'Merstham Glory'
and Gaillardia 'Clara Wells.'

Miss E. Willmott, F.L.S., Great Warley : *Lysionotus Willmottiae*
and *Pratia arenaria*.

FLORAL COMMITTEE, JULY 14, 1914.

Mr. H. B. MAY. V.H.M., in the Chair, and twenty-one members
present.

Awards Recommended :—

Gold Medal.

To Messrs. Jones, Lewisham, for Phloxes.

Silver-gilt Floral Medal.

To Messrs. May, Upper Edmonton, for Ferns.

Silver-gilt Banksian Medal.

To Mr. J. Box, Haywards Heath, for Sweet Peas.

To Sir D. Gooch, Bt. (gr. Mr. Heath), Chelmsford, for Carnations.

To Messrs. Kelway, Langport, for Gladioli.

To Col. Rt. Hon. Mark Lockwood, C.V.O. (gr. Mr. Craddock),
Romford, for Fuchsias.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Mr. J. Douglas, Great Bookham, for Carnations.

To Mr. H. Eckford, Wem, for Sweet Peas.

Silver Banksian Medal.

To Mr. H. Crane, Highgate, for Violas.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Carter Page, London, for Violas.

To Mr. A. Perry, Enfield, for hardy plants.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Mr. L. R. Russell, Richmond, for shrubs.

To Messrs. J. Veitch, Chelsea, for *Solanum Wendlandii*.

Bronze Banksian Medal.

To Messrs. Phillips & Taylor, Bracknell, for hardy plants.

Award of Merit.

To Gladiolus 'Eldorado' (votes, unanimous), from Messrs. Kelway,
Langport. A very fine pale sulphur-yellow variety, having the three
lower petals heavily blotched with dark red.

To *Michauxia Tchihatcheffii* (votes, 8 for, 4 against), from Miss

Willmott, V.M.H., Great Warley. A very interesting hardy plant from Asia Minor. Its flowers are borne on a spike measuring about 5 feet long, and are white in colour. The diameter of each flower is about $1\frac{1}{2}$ inch. The leaves are lanceolate, irregularly toothed, hairy, and average $4\frac{1}{2}$ inches in length. The stem of the plant is also very hairy.

To *Nemesia* 'Marsden Jones,' dark-flowered strain (votes, unanimous), from Mr. E. Marsden Jones, Malpas, Cheshire. A very fine strain, exceptionally free-flowering in habit. The individual flowers are dark orange, shaded and spotted with varying shades of wall-flower red. (Fig. 69.)

Other Exhibits.

Mrs. Atkinson, Southampton : Gladioli.

Messrs. Bees, Liverpool : *Primula pseudo-capitata*.

Mr. G. J. Bell, Wembley : seedling Pelargonium.

Messrs. Cutbush, Highgate : Gloxinias.

F. Du Cane Godman, Esq., London : *Alstroemeria Hookeri*.

Guildford Hardy Plant Nursery, Guildford : hardy plants.

Messrs. Kordes & Krause, Godalming : Roses.

Rev. J. H. Pemberton, Romford : Roses.

Mr. Proffittlich, Twickenham : *Astilbe Arendsii* 'Gloria.'

Messrs. Sutton, Reading : *Helianthus cucumerifolius* var. *stella*
'Sutton's Brilliant.'

Mr. E. A. Turner, Enfield : Violas.

Messrs. Ware, Feltham : hardy plants.

Mr. W. Wells, Merstham : Phloxes.

Rev. W. K. Wyley, Great Malvern : Nemesias.

FLORAL COMMITTEE, JULY 28, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. May, Upper Edmonton, for Ferns.

Silver-gilt Banksian Medal.

To Mr. J. Box, Haywards Heath, for Sweet Peas.

To The Marquis of Ripon (gr. Mr. Smith), Kingston Hill, for Hollyhocks, &c.

Silver Flora Medal.

To Messrs. Jones, Lewisham, for Phloxes and Pentstemons.

To Mr. A. Perry, Enfield, for hardy plants.

To Messrs. Smith, Woodbridge, for hardy plants.

Silver Banksian Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Mr. A. L. Gwillim, Sidcup, for hardy plants.

To Mr. L. R. Russell, Richmond, for Celosias.

Bronze Banksian Medal.

To Mr. H. H. Crane, Highgate, for Violas.

To Messrs. Carter Page, London, for hardy plants.

To Messrs. Ware, Feltham, for hardy plants.

To Mr. W. Wells, jun., Merstham, for Phloxes.

Award of Merit.

To Carnation 'Mrs. F. G. Bealing' (votes, 10 for, 2 against), from Mr. F. G. Bealing, Bassett, Southampton. A border variety said to be a cross between 'Royalty' and an unnamed seedling. The plants are very free-flowering. The flower-stalks are long and stiff. The flower is well shaped, with a good calyx and of a light rose-red colour.

To *Erica vagans* 'St. Keverne' (votes, unanimous), from P. D. Williams, Esq., St. Keverne, R.S.O., Cornwall. A form of *E. vagans* bearing rose-pink flowers. The plant was found wild in the neighbourhood of the Lizard.

To *Petunia* 'Purple King' (votes, unanimous), from Mr. A. E. Billingham, Croydon. The flower is large and double. The doubling is caused by a large number of stamens and petaloid structures which completely fill the tube. The colour is deep bright blue-violet. The pistil appeared to be normal, and the ovary contained ovules.

Other Exhibits.

Mr. F. Lilley, Guernsey : hardy bulbs.

Messrs. S. Low, Enfield : Streptocarpus.

Messrs. Piper, Bayswater : hardy plants.

Mr. G. Prince, Longworth : Roses.

Messrs. Reamsbottom, Geashill : Anemones.

Mr. G. Reuthe, Keston : hardy plants.

Messrs. Sutton, Reading : sunflowers.

Miss Willmott, V.M.H., Great Warley : *Campanula* 'Warley' *alba*.

Mr. F. Wynn, Ascot : Rose sport.

FLORAL COMMITTEE, JULY 31, 1914.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and six other members present.

Awards Recommended :—

Award of Merit.

To Pentstemon :—No. 3. 'Lady Sybil'; 4. 'Gay Garland';
5. 'Aldenham Pride'; 6. 'Persimmon'; 10. 'Admiral Togo';
14. 'Sportsman'; 22. 'Fair to See'; 44. 'Mrs. A. C. Sweet';



FIG. 66. - VERBASCUM 'WARLEY ROSE'
(*Gardeners' Chronicle*). (D. CXXXIV)

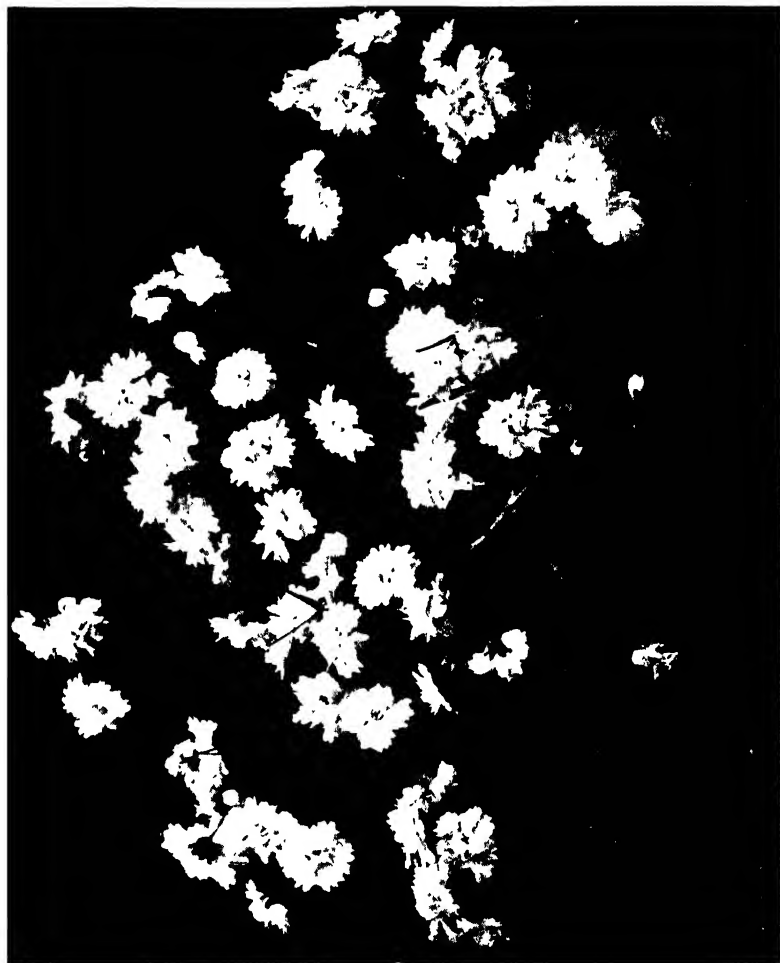


FIG 67.—*SILENE ALPESTRIS GRANDIFLORA* FL. (Gardners' *Chronicle*.) (p. CXXXII.)

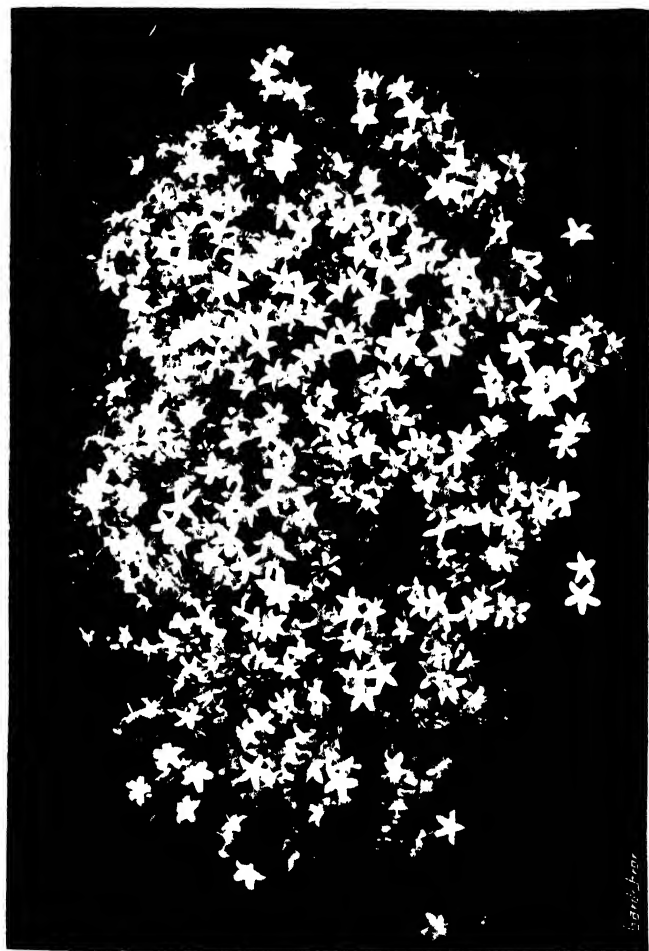


FIG. 98.—*CAMPANULA* W. H. PAINE (*Gardeners' Chronicle* 17 p. 6444111)



FIG. 69.—NEMESIA 'MARSDEN JONES' (p. cxli.)

[To face p. cxliii.]

45. 'Virgil'; 54. 'Rosamund'; 60. 'James Douglas'; 62. 'Jane Dieulafoy'; 63, 64, 65. 'Southgate Gem'; 67. 'Phryne'; 77. 'Mrs. Fred. Fulford'; 83. 'Margarete Bader'; 97. 'Crimson Gem'; 128. 'Alex. Wood'; 135. 'President Carnot.'

Highly Commended.

Pentstemon:—No. 1. 'Gertrude Saunders'; 17. 'Clorinda'; 32. 'The Gift'; 120. 'Tweed'; 142. 'Seagull'; 146. 'Mrs. P. S. Hayward.'

SUB-COMMITTEE AT WISLEY, AUGUST 28, 1914.

Mr. H. B. MAY, in the Chair, and six other members present.

Awards Recommended :—

Award of Merit.

To Aster (*Callistephus*):—No. 34. Comet, shell-pink, shaded white; 90. Giant Comet, 'Ruby'; 93. Giant Comet, 'The Bride'; 146. 'The Prince'; 147. 'Toison d'Or.'

Highly Commended.

Aster:—No. 1. 'Aurora'; 35. Comet, snow white; 36. Comet, pale lavender blue; 38. Dwarf Pæony-flowered 'Perfection,' black blue; 42. Dwarf Pæony-flowered 'Perfection,' dark scarlet; 43. Dwarf Pæony-flowered 'Perfection,' dark scarlet and white; 48. Dwarf Pæony-flowered 'Perfection,' rose; 56. 'Elegance,' lavender; 79. Giant Comet, fiery scarlet; 81. Giant Comet, light blue; 86. Giant Comet, pure white; 95. Giant Comet, white, turning to amethyst blue; 99. 'Gloria'; 102. 'Hohenzollern,' brilliant rose; 119. New Giant White, 'Hercules'; 120. New Giant 'Hohenzollern,' shell-pink; 129. New Yellow, 'Sunlight'; 139. 'Ruby' (single); 166. 'Victoria,' carmine rose; 169. 'Victoria,' dark blue; 171. 'Victoria,' dark scarlet; 189. 'Victoria,' white, tinted rose; 192. 'White Wonder.'

Commended.

Aster:—44. Dwarf Pæony-flowered 'Perfection,' light blue; 39. Dwarf Pæony-flowered 'Perfection,' black violet.

ORCHID COMMITTEE.

MAY 5, 1914.

Mr. J. GURNEY FOWLER in the Chair, and twenty-five members present.

Awards Recommended :—

Silver Flora Medal.

To H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood), for a group.

To Messrs. Stuart Low, Bush Hill Park, for a group of *Dendrobium Jamesianum*, *Renanthera Imschootiana*, &c.

Silver Banksian Medal.

To Messrs. Hassall, Southgate, for varieties of *Cattleya Schroederae* and hybrids.

First-class Certificate.

To *Odontoglossum crispum* 'The Baroness' (votes, 14 for, 6 against), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). The fine variety to which an A.M. was given June 17, 1913. Flowers large and of perfect shape, white, closely blotched with violet-purple. (Fig. 71.)

To *Odontoglossum* × 'Helmut' (parentage unrecorded), (votes 16 for, 0 against), from Baron Bruno Schröder. Flowers claret-red, with white margin and tips to the segments. Of the *O.* × *illustrissimum* class. (Fig. 72.)

Award of Merit.

To *Bulbophyllum Fletcherianum* n. sp. (votes unanimous), from the Rev. J. C. B. Fletcher, Mundham Vicarage, Chichester. A remarkable large species from New Guinea. Pseudo-bulbs and leaves fleshy, purplish green, with a glaucous surface. Flowers seven in a short raceme. Upper sepal 2 inches; lateral sepals narrower, connivent, both claret-colour with some light spotting. Petals 1 inch; lip smaller, both bright claret-red. The texture and colouring of the flowers resemble a *Stapelia*.

To *Cypripedium macranthum album* (votes unanimous), from Mr. G. Reuthe, Fox Hill, Keston. A pure white form of the well-known rose-coloured hardy species.

To *Oncidioda* × *Mauricii* (*Oncidium tigrinum* × *Cochlidoda vulcanica*) (votes, 15 for, 1 against), from Monsieur H. Graire, Amiens. Inflorescence erect, bearing several flowers 2 inches in length. Sepals and petals dull purple, lip primrose yellow.

Other Exhibits.

Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander) ;
Odontiodas and *Miltonia* × 'White Admiral.'

The Hon. Lady Neeld: *Odontioda* × 'Diana,' Grittleton variety.

Mrs. Norman Cookson: *Odontoglossums* and *Odontiodas*.

de B. Crawshay, Esq.: hybrid *Odontoglossums*.

F. M. Ogilvie, Esq.: *Odontoglossum Harwoodii*, the Shrubbery variety.

Messrs. Charlesworth: a group.

Messrs. Flory & Black: hybrids.

Messrs. Davidson: *Sophrholaeliocattleya* × 'Donila.'

R. G. Thwaites, Esq.: hybrids.

Monsieur Mertens: *Miltonias*.

ORCHID COMMITTEE AT CHELSEA, MAY 19, 1914.

Sir HARRY J. VEITCH in the Chair, and twenty-three members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. xcvi.]

Awards Recommended :—*First-class Certificate.*

To *Miltonia* × 'J. Gurney Fowler' (*M. vexillaria* 'Memoria G. D. Owen' × unknown) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. A very large flower of a clear rose-pink colour, with dark ruby-red mask at the base of the lip.

To *Miltonia* × 'The Baroness' (*M. vexillaria* 'Memoria G. D. Owen' × unknown) (votes unanimous), from Messrs. Armstrong & Brown. A fine white flower with dark crimson mask, changing to ruby red.

To *Miltonia vexillaria* 'Laelia Sander' (votes unanimous), from Messrs. Sander, St. Albans. A new type with pale primrose-yellow ground-colour and soft violet mask to the lip, the bases of the petals being also tinged violet.

To *Miltonia* × 'Princess Victoria Alexandra' (votes unanimous), from Monsieur Chas. Vuylsteke, Ghent. A large white form with plum-coloured mask to the lip.

To *Odontoglossum* × 'Queen Alexandrina' (parentage unrecorded) (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Of the *O. × illustrissimum* class. Flowers claret-colour, with white margins and white front to the lip.

To *Laeliocattleya* × 'Medina Excelsior' (*L.-c.* × *Canhamiana alba* × *C.* × 'Mrs. Myra Peeters') (votes unanimous), from Messrs. Flory & Black, Slough. A very fine hybrid with the form of *Cattleya Warneri alba* obtained from the *Cattleya* parent. The broad sepals and petals are blush-white; the finely-expanded front of the lip ruby-red.

To *Laeliocattleya* × *Haroldiana* 'Bronze King' (*L. tenebrosa* × *C. Hardyana*) (votes unanimous), from Messrs. Stuart Low, Bush Hill Park. Flowers copper-red, with a rose shade. Lip claret-purple.

To *Odontioda* × *Bradshawiae* 'Perfection' (*O. crispum* × *C. Noezliana*) (votes unanimous), from Messrs. McBean, Cooksbridge. A brilliant red variety, with broad and well-formed flowers.

Award of Merit.

To *Brassocattleya* × *Shilliana* (*B.-c. Digbyano-Mossiae* × *C. Mossiae*) (votes unanimous) from Messrs. Armstrong & Brown, Tunbridge Wells. Flower approaching *C. Mossiae* in shape; rose-pink, with yellow disc to the lip.

To *Odontoglossum* × 'Chanticleer' (parentage unrecorded) (votes, 17 for, 1 against), from Messrs. Armstrong & Brown. Flower brownish orange-red, with white margin, and white front to the lip.

To *Laeliocattleya* × *Fascinator-Mossiae* 'Purity' (*L.-c.* × *Fascinator-Mossiae* × *C. Mossiae Wageri*) (votes, 15 for, 0 against), from Messrs. Charlesworth. Flower pure white, with a pale yellow centre to the lip.

To *Odontoglossum* × 'Dusky Monarch' (parentage unrecorded) (votes, 12 for, 4 against), from Messrs. Charlesworth. Flowers of fine shape, deep claret-colour, with a few white markings, and white margin.

To *Odontonia* × 'Roger Sander' (*Miltonia Warscewiczii* × *Odontoglossum* × *perculum*) (votes, 17 for, 4 against), from Messrs. Sander. The fourth of a decorative class raised by Messrs. Sander. Sepals and petals purple, with blush-white tips. Lip blush-white, with mauve spots at the base.

To *Cattleya* × 'Magali Sander' (*Dusseldorfei* 'Undine' × *Mossiae Wageri*) (votes, 16 for, 0 against), from Messrs. Sander. A pure white flower, of good shape and substance.

To *Cymbidium* × 'Venus' (*Holfordianum* × *insigne*) (votes unanimous), from Messrs. Stuart Low. Flower broad in all its parts; wax-like, blush white, with small violet spots on the lip.

To *Miltonia* × *Hyeana* 'Adonis' (*Bleuana rosea* × *vexillaria* 'Memoria G. D. Owen') (votes, 14 for, 3 against), from Monsieur Chas. Vuylsteke, Ghent. Flower white, with deep maroon mask to the lip.

To *Odontioda* × 'Prince de Galles' (*O. mirum* × *Oda.* × *Vuylstekeae*) (votes, 14 for, 3 against), from Monsieur Chas. Vuylsteke. Of the *O.* × 'Coronation' class. Flowers blush-white, handsomely blotched with red.

Cultural Commendation.

To Mr. Collier (gr. to Sir Jeremiah Colman, Bt.), for a fine specimen of *Odontioda* × *Bradshawiae* 'Fire King.'

To Mr. Collier, for *Dendrobium Lyoni* with five spikes.

To Mr. E. Hill (gr. to F. J. O. Montagu, Esq., Lynford Hall, Mundford), for an immense specimen of *Cattleya intermedia alba* with 16 spikes, 56 flowers.

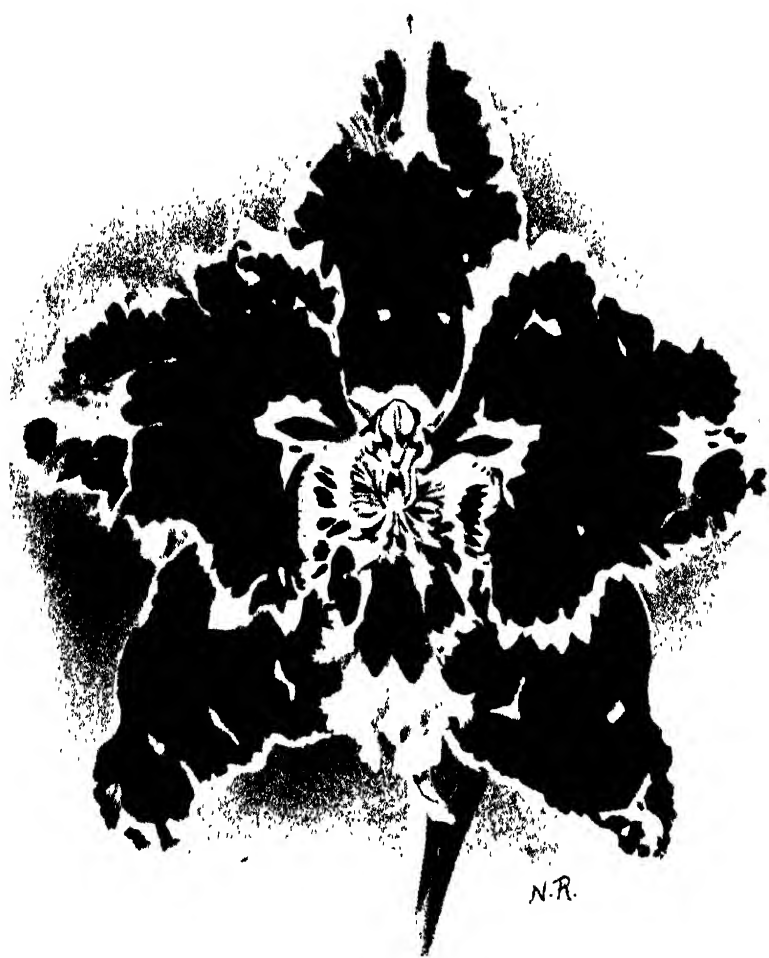


FIG. 70.—ODONTOGLOSSUM × 'MIRABEAU' VAR 'MASTIFF' (McBenn.) (p lxxvi)

[To face p cxlvi.]



FIG. 71. *ODONTOGLOSSUM CRISPUM* 'FRL. BARONESS' (p. caliv.)

Other Exhibits.

Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander) : *Odontioda* × 'Queen Mary,' Westonbirt variety.

J. Gurney Fowler, Esq. (gr. Mr. J. Davis) : *Odontioda* × *oakwoodiensis*, Fowler's var. (*Oda.* × *Bradshawiae* × *Odm.* × *percultum*), *Odontioda* × *rubens* (*Oda.* × *Charlesworthii* × *Odm.* × *eximum*), and *Brassolaelia* × 'Madame Irene Mavrocordato,' Brackenhurst variety.

W. R. Lee, Esq. : *Miltonia vexillaria alba*.

Monsieur Jules Hye de Crom : *Miltonia vexillaria alba*, small-flowered type.

J. J. Bolton, Esq. : *Odontoglossum* × *eximum Boltonii*.

Ernest G. Mocatta, Esq. : *Miltonia vexillaria*.

R. Ashworth, Esq. : *Cypripedium bellatulum* 'R. Ashworth.'

ORCHID COMMITTEE, JUNE 3, 1914.

Mr. J. GURNEY FOWLER in the Chair, and twenty members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for home-raised Miltonias and other Orchids.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for a group,

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Odontoglossums*, *Odontiodas*, &c.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for a group.

Silver Banksian Medal.

To Messrs. Hassall, Southgate, for a group.

To Messrs. McBean, Cooksbridge, for *Cattleyas* and other Orchids.

Other Exhibits.

Baron Bruno Schröder : *Odontoglossum crispum* 'The Dell Sunrise.'

R. G. Thwaites, Esq. : hybrids.

G. W. Bird, Esq. : *Odontioda* × 'Phyllis' (*Odm. Lambeauianum* × *Oda.* × *Bradshawiae*).

Col. S. R. Clarke, C.B. : *Odontoglossum* × 'Ethelreda.'

Sir Montagu Turner : *Cattleya Mendelii*.

W. P. Burkinshaw, Esq. : *Brassocattleya* × *Rex* (*C. Rex* × *B. Digbyana*).

Messrs. Flory & Black : *Brassolaeliocattleya* × 'Albatross' (*B.-l.* × *Digbyano-purpurata* × *C. Mossiae*).

ORCHID COMMITTEE, JUNE 16, 1914.

Sir HARRY J. VEITCH in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To His Grace the Duke of Marlborough, Blenheim Palace, Woodstock (gr. Mr. Hunter), for white *Cattleyas* and *Cypripediums*.

To E. R. Ashton, Esq., Broadlands, Tunbridge Wells (gr. Mr. Young), for hybrids, including several novelties.

To Messrs. Stuart Low, Jarvisbrook, for *Cattleyas*, *Dendrobiums*, &c.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for fine hybrids.

First-class Certificate.

To *Odontoglossum* × 'King Arthur' (parentage unrecorded) (votes unanimous), from Messrs. McBean, Cooksbridge. A showy flower of the *O.* × *amabile* section, and one of the largest. The inner parts of the segments are blotched with claret-red, the outer, and margin white but tinged with colour from the deep violet colour of the backs of the segments. (Fig. 73.)

Cultural Commendation.

To Mr. Balmforth, gr. to F. M. Oglivie, Esq., The Shrubbery, Oxford, for four fine plants of *Cypripedium Lawrenceanum Hyeianum*, Bank House variety, each with several flowers.

Other Exhibits.

Earl Brownlow, Ashridge Park (gr. Mr. Robertson): two fine specimens of *Coelogyne Dayana*.

J. Gurney Fowler, Esq. (gr. Mr. Davis): *Odontoglossum* × 'Aquitania,' a very large and beautiful hybrid.

Pantia Ralli, Esq., Ashted Park: *Cattleya Mendelii* 'Knight Templar' and *Odontoglossum* × 'Doris.'

H. S. Goodson, Esq. (gr. Mr. G. E. Day): *Odontioda* × 'Patricia' (*Od.* × 'Phoebe' × *Oda.* × *Charlesworthii*).

R. G. Thwaites, Esq., Streatham: *Laeliocattleyas*.

Messrs. Hassall, Southgate: *Laeliocattleyas*.

Mr. W. Shackleton, Bradford: *Odontioda* × *Brewii*, Highfield variety.

ORCHID COMMITTEE, JUNE 30, 1914.

AT HOLLAND HOUSE.

Sir HARRY J. VEITCH in the Chair and twenty-three members present.

[For awards of cups and medals made by the Council after consultation with the Judges see p. cvii.]

Awards Recommended :—

First-class Certificate.

To *Cattleya* × 'Irene' ('Suzanne Hye de Crom' × *Mossiae Wageneri*) (votes unanimous), from J. Gurney Fowler, Esq., Bracken-

hurst, Pembury (gr. Mr. J. Davis). One of the finest of white Cattleyas, the three parts *C. Mossiae Wageneri* giving the fine shape and substance, while the influence of *C. Gaskelliana alba* adds size and fragrance. Flowers pure white, with chrome-yellow disc to the lip.

To *Miltonia vexillaria illustris* (votes unanimous), from Messrs. Sander. One of a batch of home-raised seedlings. Flowers large, rosy-lilac, with a large mask of red-purple lines on the lip.

To *Odontonia* × *Cleverleyana* (*Miltonia vexillaria Leopoldii* × *Odm.* × *Rolfeae*) (votes 19 for, 0 against), from Messrs. Mansell & Hatcher, Rawdon, Leeds. Flowers flatly arranged as in *Miltonia*, white, evenly spotted with rose, and having a ray of Indian-red lines at the base of the lip.

Award of Merit.

To *Laeliocattleya* × 'Aphrodite' var. 'Our Queen' (*L. purpurata* × *C. Mendelii*) (votes unanimous), from Messrs. Stuart Low, Jarvisbrook, Sussex. A handsome variety, with broad white sepals and petals and violet-crimson lip.

To *Miltonia* × *Sanderæ* var. 'Enchantress' (*vexillaria* 'Memoria G. D. Owen' × 'St. André') (votes unanimous) from Messrs. Sander. Flowers soft carmine-rose on white, the lip having a mask of orange-red lines.

To *Vuykstekeara* × *insignis* (*Miltonia* × *Bleuana* × *Odontioda* × *Charlesworthii*) (votes unanimous), from Monsieur Firmin Lambeau, Brussels. The generic name is framed to combine *Miltonia*, *Cochlioda*, and *Odontoglossum*. The flowers retain most of the *Miltonia*. Colour cream-white, with a cluster of sepia brown spots on the petals and lip. (Fig. 74.)

Renanthera pulchella Rolfe (votes unanimous), from Monsieur A. A. Peeters, Brussels. A singular little species imported with *R. Imshoohtania* and resembling a rudimentary form of that species. Flowers yellowish, tinged with red, and having red tips to the petals.

Other Exhibits.

W. Waters Butler, Esq., Edgbaston: *Cattleya* × 'Clymene' and *C. Warscewiczii*, Southfield variety.

J. Gurney Fowler, Esq.: *Laeliocattleya* × *Canhamiana alba*.

R. Brooman White, Esq.: *Odontoglossum crispum* 'Chancellor of the Exchequer.'

Messrs. Armstrong & Brown: hybrid Orchids.

H. Dundee Hooper, Esq.: *Odontoglossum coronarium*.

ORCHID COMMITTEE, JULY 14, 1914.

Mr. J. GURNEY FOWLER in the Chair, and fifteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group of many rare species.

To Messrs. Stuart Low, Jarvisbrook, for Cattleyas, Laeliocattleyas, &c.

cl PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

First-class Certificate.

To *Miltonia vexillaria* 'The Rev. W. Wilks' (*gigantea* × 'Queen Alexandra') (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). An extraordinary home-raised variety, of fine size and substance and unique in colour. Flowers delicate peach-blossom colour, slightly darker in the veining, and having a light violet flush at the base of the petals, the crest of the lip being yellow, with light reddish lines. (Fig. 75.)

To *Odontonia* × *Charlesworthii* (*Odm. Uro-Skinneri* × *Miltonia vexillaria*) (votes unanimous), from Messrs. Charlesworth, Haywards Heath. Plant in growth intermediate between the parents. Inflorescence erect, bearing four flowers, flatly arranged as in *M. vexillaria*, and over one inch across. Sepals and petals with white ground, spotted with dark purple. Lip shaped like *M. vexillaria*, bright magenta-rose in front. Crest yellow, with ruby-red markings on white ground in front.

To *Odontoglossum* × *percultum* 'King George' (*Rolfeae* × *ardentissimum*) (votes, 12 for, 1 against), from F. Menteith Ogilvie, Esq., Oxford (gr. Mr. Balmforth). The fine form which secured an **A.M.** July 2, 1912, but now improved. Flowers white, with large transverse purple blotches. The spike bore 12 blooms.

Award of Merit.

To *Brassocattleya* × 'Ilene,' The Dell variety (*B.-c.* × 'Madame Chas. Maron' × *C. Dowiana*) (votes unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). The second crossing with *C. Dowiana* resulted in a larger flower of firm substance, bright rose, with a yellow disc to the fringed lip.

Cultural Commendation.

To Mr. J. Davis (gr. to J. Gurney Fowler, Esq.), for a fine specimen of *Cattleya Warscewiczii*, with six spikes and twenty-three flowers.

To Mr. W. H. White, Orchid-grower to Elizabeth Lady Lawrence, Burford, for a specimen of *Odontoglossum Pescatorei* with five branched spikes of white flowers.

Other Exhibits.

F. Menteith Ogilvie, Esq. : *Odontoglossum Uro-anthum* (*Kegeljani* (*polyxanthum*) × *Uro-Skinneri*).

E. R. Ashton, Esq. : *Odontioda* × *Hemphillneana*, Broadlands variety, and *Sophrolaeliocattleya* × 'Sibyl.'

H. S. Goodson, Esq. : *Odontoglossum* × 'Snowflake.'

Messrs. Flory & Black : *Cattleya Gaskelliana alba* and other Orchids.

Messrs. McBean : a group.



FIG. 72. ODONTOGLOSSUM "HELMUT" (p. cxlv.)

Ho. lacc. p. cl.

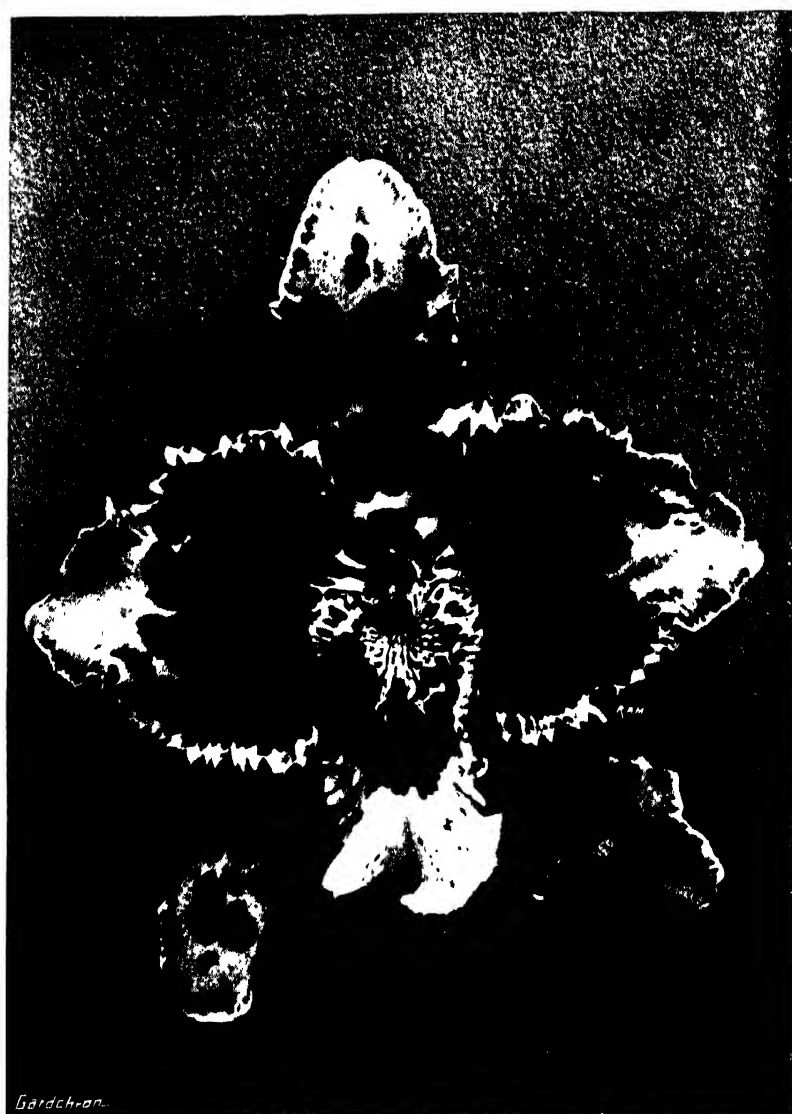


FIG. 73 —ODONTOGLOSSUM A 'KING ARTHUR' (*Gardeners' Chronicle*) (p. cxlviii)

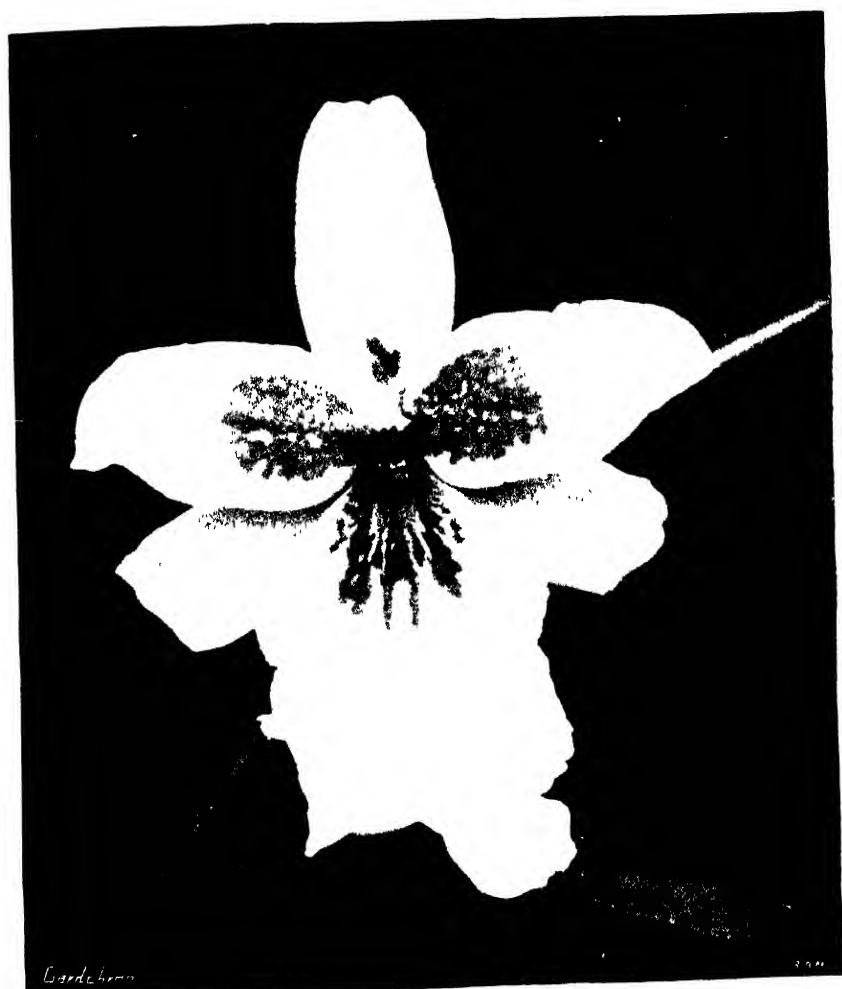


FIG. 74 VUYLSTEKEARA INSIGNIS (Gardener's Chronicle) (p. cxlix.)

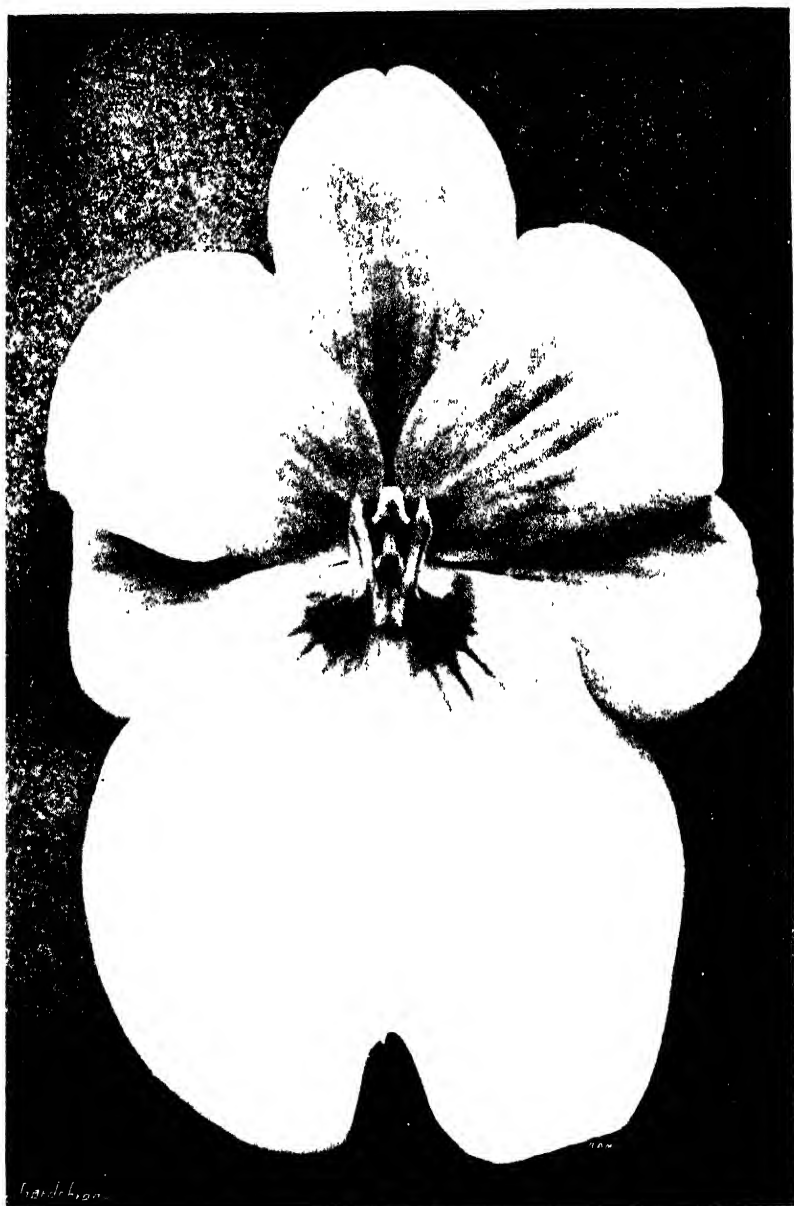


FIG. 75 - MILTONIA VEXILLARIA 'THE REV. W. WILKS' (*Gardener's Chronicle*) (p. cl.)

110 face p. cl.

ORCHID COMMITTEE, JULY 28, 1914.

Mr. J. GURNEY FOWLER in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Sander, St. Albans, for a group.

Award of Merit.

To *Laeliocattleya* × 'Miss Louisa Fowler' (*L.-c.* × *callistoglossa* × *C. granulosa*) (votes unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Tunbridge Wells (gr. Mr. J. Davis). Flowers large, with the outline of *C. granulosa*. Sepals and petals bright lilac, with rose veining. Lip purple, with some yellow markings at the base.

To *Cattleya* × *Hardyana* var. *rubens* (*Warscewiczii* × *Dowiana aurea*) (votes unanimous), from J. Gurney Fowler, Esq. Sepals and petals rosy-lilac, lip broad, deep ruby-red, with a clear yellow blotch on each side at the opening of the tube.

To *Oncidium Leopoldianum* (votes unanimous), from H. S. Goodson, Esq., Fairlawn, Putney. The first true plant of the species to flower. It was originally imported by L'Horticulture Internationale, Brussels, and described from dried specimens in 'The Gardeners' Chronicle,' November 15, 1890, p. 566. (Fig. 76.)

On October 24, 1905, a plant obtained from the same source was shown as *O. Leopoldianum*, but was identified as the allied *O. corynephorum*, and awarded a First-class Certificate. The fact of the two being similar in some respects, and both having been obtained from the same source, gave rise to the supposition that they were forms of the same species. They are, however, botanically distinct. The spike of the *O. Leopoldianum* shown was long and twining, bearing numerous branches of two to six flowers, forty-five in all. Flowers 1½ inches in width. Sepals and petals stalked, with ovate acuminate blades, white, freckled with rose in the centre. Lip triangular, yellow on the basal half, purple in front. (See JOURNAL R.H.S. vol. xxxi. p. clxxxvii.)

Other Exhibits.

His Grace the Duke of Marlborough: *Vanda coerulea* 'Grace' and *Cypripedium* × *Lawrebel*, Blenheim variety.

Baron Bruno Schröder: *Cattleya* × 'Astron' (*Harrisoniana alba* × *Dusseldorfei* 'Undine'), pure white.

J. Gurney Fowler, Esq.: *Laeliocattleya* × 'Maqueda,' Brackenhurst variety.

R. G. Thwaites, Esq.: *Odontiodas*.

Eustace F. Clark, Esq.: flowers of *Laeliocattleyas*.

Mr. C. F. Waters: *Brassocattleya*.

NARCISSUS AND TULIP COMMITTEE.

MARCH 10, 1914.

Mr. E. A. BOWLES in the Chair, and seventeen members present.

The Committee tendered its thanks to the Hon. Sec., Mr. C. H. Curtis, for his work in connexion with the newly-issued 1914 edition of "The Daffodil List"; and to the Rev. Joseph Jacob for services rendered in the production of "The Daffodil Year Book."

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.
To Messrs. Barr, Covent Garden, for Daffodils.

Silver Flora Medal.

To Messrs. Jas. Carter, Raynes Park, for Daffodils and Tulips in pots.
To Messrs. J. R. Pearson, Lowdham, for Daffodils.
To Messrs. Walter T. Ware, Inglescombe, Bath, for Daffodils.
To Mr. Christopher Bourne, Bletchley, for Daffodils.

Silver Banksian Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'Olympia' (votes, 11 for, 3 against), for pot culture, from Messrs. Cartwright & Goodwin. Received A.M. April 24, 1900.

To *Narcissus* 'W. P. Milner' (votes, 10 for, 1 against), for rock-work, from Messrs. Cartwright & Goodwin. An old trumpet variety, with drooping, pale sulphur or cream-coloured flowers, and modest growth.

NARCISSUS AND TULIP COMMITTEE, MARCH 24, 1914.

Mr. E. A. BOWLES in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Barr, Covent Garden, for Daffodils.
To Mr. Alex. M. Wilson, Shovel, for Daffodils.

Silver Flora Medal.

To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.
To Messrs. R. H. Bath, Wisbech, for Daffodils.

Silver Banksian Medal.

To Mr. C. Bourne, Bletchley, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'Syphax' (votes, 14 for, 1 against), for garden purposes, and (votes, 12 for, 0 against) for cutting, from Mr. A. M. Wilson, Shovel. A beautiful *N. Jonquilla* hybrid raised by Mr. J. C. Williams; the colour is rich golden-yellow, and the variety is free in growth and flower.

To *Narcissus* 'Tita' (votes, 12 for, 0 against), for garden purposes, and (votes, 13 for, 0 against) for cutting, from Mr. A. M. Wilson. An *Incomparabilis* variety with soft sulphur-yellow perianth and frilled orange cup, raised by Mr. P. D. Williams.

To *Narcissus* 'Sunrise' (votes, 11 for, 0 against), for cutting, from Mr. A. M. Wilson. A neat and beautiful bicolor *Parrii* variety raised by Mrs. R. O. Backhouse; perianth cream-white; cup broad, crimped, and vivid orange.

To *Narcissus* 'Eastern Maid' (votes, 12 for, 0 against), for exhibition, from Messrs. R. H. Bath. A finely proportioned and handsome variety, with broad, soft-yellow perianth segments, and a short, frilled, golden-yellow trumpet. (Fig. 77.)

NARCISSUS AND TULIP COMMITTEE, APRIL 7, 1914.

Mr. E. A. BOWLES in the Chair, and twenty-three members present.

Awards Recommended :—*Silver-gilt Flora Medal.*

To Messrs. Barr, Covent Garden, for Daffodils.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.

To Mr. A. M. Wilson, Shovel, for Daffodils.

Silver-gilt Banksian Medal.

To Mr. C. Bourne, Bletchley, for Daffodils and Tulips.

To Messrs. Sutton, Reading, for Daffodils.

Silver Flora Medal.

To Mr. F. Herbert Chapman, Rye, for Daffodils.

Silver Banksian Medal.

To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.

To Messrs. Walter T. Ware, Inglescombe, for Daffodils.

Award of Merit.

To *Narcissus* 'Tantalus' (votes, 18 for, 0 against), for cutting, from Mr. W. A. Watts, St. Asaph. A giant *Leedsii* variety, with broad white perianth segments and a bold, frilled, soft-yellow crown that is practically a trumpet.

To *Narcissus* 'Inglescombe' (votes, 14 for, 0 against) for cutting, from Mr. A. M. Wilson. A splendid double yellow sport from 'Sulphur Phoenix.'

To *Narcissus* 'Croesus' (votes, 13 for, 0 against) for garden purposes, from Mr. A. M. Wilson. Received F.C.C. April 2, 1912.

To *Narcissus* 'Ivorine' (votes, 13 for, 0 against) for exhibition, from Messrs Cartwright & Goodwin. A fine Leedsii variety, with broad yellow crown and ivory-white perianth. (Fig. 78.)

To *Narcissus* 'Royal Sovereign' (votes, 11 for, 0 against) for exhibition, from Messrs. Cartwright & Goodwin. A showy double variety, with unequal segments, the long ones yellow and the shorter ones cream-white.

To *Narcissus* 'White Maximus' (votes, 16 for, 0 against) for exhibition, from Messrs. Walter T. Ware. A cream-white variety, with broader and flatter perianth segments than its golden namesake.

To *Narcissus* 'Queen Primrose' (votes, 12 for, 0 against) for exhibition, from Mr. H. D. Phillips, Olton. A large Trumpet variety with a wide-mouthed sulphur-yellow trumpet and a shapely pale primrose perianth.

NARCISSUS AND TULIP COMMITTEE, APRIL 15, 1914.

Mr. E. A. BOWLES in the Chair, and twenty-one members present.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, Covent Garden, for Daffodils and Tulips.

Silver-gilt Flora Medal.

To Messrs. J. R. Pearson, Lowdham, for Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.

Silver Flora Medal.

To Messrs Bath, Wisbech, for Daffodils and Tulips.

To Mr. C. Bourne, Bletchley, for Daffodils.

To Messrs. Walter T. Ware, Inglescombe, for Daffodils.

To Mr. W. A. Watts, St. Asaph, for Daffodils.

Silver Banksian Medal.

To Lissadel Bulb Farm, Sligo, for Daffodils.

To Messrs. Robt. Sydenham, Birmingham, for Daffodils.

To Messrs. Sutton, Reading, for Daffodils.

To Messrs. Jas. Carter, Raynes Park, for Daffodils.

Award of Merit.

To *Narcissus* 'Lady Superior' (votes, 21 for, 0 against) for exhibition, from Messrs. Bath. A big Barrii variety, with white perianth



FIG. 56. *ONCIDIUM LEOPOLDIANUM* (p. ch.)



FIG. 77 —NARCISSUS, 'EASTERN MAID' (p. cliii.)

[To face p. clv

segments of fine size and substance, and a crimson-rimmed, yellow crown.

To *Narcissus* 'Nightingale' (votes, 19 for, 0 against) for exhibition, from Messrs. Cartwright & Goodwin. An early, large-flowered Poeticus variety, with a crimson and orange crown. (Fig. 79)

To *Narcissus* 'Morven' (votes, 16 for, 0 against) for exhibition, from Messrs. Cartwright & Goodwin. This is a very refined and shapely Trumpet variety, the perianth pure white and the trumpet pale lemon-yellow. (Fig. 80.)

To *Narcissus* 'Scarlet Gem' (votes, 14 for, 0 against) for exhibition, from Messrs. Cartwright & Goodwin. A showy, shapely medium-sized Poetaz variety, the perianth deep yellow and the crown vivid orange.

To *Narcissus* 'Southern Gem' (votes, 15 for, 1 against) for garden purposes and for cutting, from Mr. H. D. Phillips. A bold giant Leedsii variety, with broad, white perianth segments of considerable substance, and a primrose-yellow cup.

To *Narcissus* 'Admiration' (votes, 12 for, 3 against) for garden purposes, from Messrs. M. Van Waveren & Sons, Hillegom, Holland. An effective Poetaz variety, with fair-sized flowers carried in large clusters on stout stems; perianth rich yellow, crown orange.

To *Narcissus* 'Princess Juliana' (votes, 10 for, 5 against) for exhibition, from Messrs. de Graaff, Leiden, Holland. A large golden-yellow Trumpet variety, with a wide-mouthed and deeply-frilled trumpet.

To *Narcissus* 'Golden Sceptre' (votes, 15 for, 0 against) for exhibition, from Messrs. de Graaff. A bold, deep, golden-yellow hybrid from *N. Jonquilla*; the crown is widely expanded and the flowers are very sweetly scented.

NARCISSUS AND TULIP COMMITTEE, APRIL 21, 1914.

Mr. E. A. Bowles in the Chair, and sixteen members present.

A preliminary discussion took place upon Mr. Lemeslie Adams' proposals concerning the granting of awards, such proposals having been sent to the members. Eventually Mr. R. Wallace and Mr. J. D. Pearson gave notice to move on May 5 "That an extra meeting of the Committee be held for the purpose of drawing up Lists of not more than twenty well-known varieties of Daffodils suitable for Show, Garden, Pots, Cutting, and Rock Garden respectively; such Lists to be published in the Society's JOURNAL, 'The Daffodil List,' and 'The Daffodil Year Book.'"

Mr. Adams agreed to withdraw his proposals if this motion found favour with the Committee. (See p. clvii.)

Awards Recommended:—

Barr Memorial Cup.

Mr. E. M. Crossfield, Cossington House, Bridgwater.

Silver-gilt Flora Medal.

To Messrs. Barr, Covent Garden, for Daffodils and Tulips.

Silver Flora Medal.

To Mr. C. Bourne, Bletchley, for Daffodils and Tulips.

Award of Merit.

To *Narcissus* 'Horace' (votes 8 for, 0 against) for garden purposes and for cutting, from Messrs. Barr. A well-known Poeticus variety that carries its white, crimson-crowned flowers on tall stems.

To *Narcissus* 'Cleopatra' (votes, 9 for, 0 against) for garden purposes, from Messrs. Barr. Received A.M. April 21, 1902.

To *Narcissus* 'Bedouin' (votes, 7 for, 0 against) for garden purposes and for cutting, from Messrs. Barr. A beautiful bicolor Incomparabilis variety, with white perianth and orange-yellow crown ; of fine size and substance.

To *Narcissus* 'Josine' (votes 7 for, 1 against) for garden purposes, from Messrs. E. H. Krelage, Haarlem, Holland. A charming Trumpet Daffodil, of fine form ; the neatly-frilled trumpet is white and the perianth light primrose.

To Tulip 'Pelican' (votes, 7 for, 0 against), from Messrs. Van Waveren & Kruyff, Sassenheim, Holland. A fine pure white sport from the popular 'La Reine.'

To Tulip 'Ibis' (votes, 6 for, 1 against), from Messrs. Van Waveren and Kruyff. A large variety, with bold, rounded, red flowers, shaded with rose ; white base, yellow stamens, and black anthers.

To *Tulipa stellata* (votes, 7 for, 0 against), from Messrs. Barr. A pretty, slender-stemmed Tulip, with glaucous-green, wavy leaves, and yellow flowers that are flushed with red on the outside of the three outer segments. The Kew authorities consider that *T. stellata*, as shown by Messrs. Barr, is *T. chrysantha* Boissier.

NARCISSUS AND TULIP COMMITTEE, MAY 5, 1914.

Mr. E. A. BOWLES in the Chair, and twenty members present.

The motion of which notice was given at the previous meeting was brought forward and carried. Mr. Adams consequently withdrew his proposals. The Hon. Sec. was requested to prepare voting papers and send them to members of committee, requesting their prompt return with lists of twenty varieties under the several headings. [This was done, and at a subsequent special meeting the votes were checked and the twenty leading varieties in each group with the exception of the Exhibition varieties were placed in order according to the votes received, see p. clvii.]

Awards Recommended :—

Gold Medal.

To Messrs. Barr, Covent Garden, for a large collection of Tulips, chiefly Darwin and other May-flowering varieties.

Silver-gilt Flora Medal.

To Mr. W. A. Watts, St. Asaph, for Tulips.

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for Tulips.

To Messrs. Dobbie, Edinburgh, for Tulips.

Silver Flora Medal.

To Messrs. R. Wallace, Colchester, for Tulips.

To Messrs. Alex. Dickson, Newtownards, for Tulips.

To Messrs. Cartwright & Goodwin, Kidderminster, for Tulips.

To Messrs. Jas. Carter, Raynes Park, for Tulips.

Silver Banksian Medal.

To Messrs. Robt. Sydenham, Birmingham, for Tulips.

To Messrs. Wm. Cutbush, Highgate, for Tulips.

First-class Certificate.

To Tulip 'Siren' (votes, 13 for, 1 against), from Messrs. E. H. Krelage, Haarlem, Holland. A distinct and new Tulip obtained by crossing *Tulipa retroflexa* with a pink Darwin variety. The flowers have the grace and form of *T. retroflexa*, but all the segments are broadened and reflexed prettily at the tips. The colour is rich cerise-pink, with paler pink margins and a white base. Tulip 'Siren' is the first comer of a new race that has been given the popular title of 'Lily-flowered.' (Fig. 81.)

To Tulip 'Grenadier' (votes, 13 for, 0 against), from Mr. H. D. Phillips, Olton. A scarlet, yellow-based variety that gained an A.M. on April 30, 1912.

SELECTED DAFFODILS SUITABLE FOR VARIOUS PURPOSES.—1914.

FOR the purpose of placing before the public lists of select Daffodils suitable for various purposes, the members of the Royal Horticultural Society's Narcissus and Tulip Committee were invited to contribute what, in their view, were the best twenty varieties for the Garden, for Pots, for Cutting, and for the Rock Garden. The varieties named by the members were then audited, and, in accordance with the number of times they were mentioned, they were assigned positions in the following lists.

It was decided not to issue, at present, a list of varieties suitable for Exhibition.

C. H. CURTIS,
Secretary to Committee.

DAFFODILS FOR THE GARDEN.

Madame de Graaff.	Argent.
<i>Barrii conspicuus.</i>	Cassandra.
Emperor.	Blackwell.
Sir Watkin.	Duke of Bedford.
Empress.	Seagull.
Lady Margaret Boscawen.	Gloria Mundi.
Lucifer.	Golden Spur.
White Lady.	Homespun.
Weardale Perfection.	King Alfred.
Horace.	<i>poeticus recurvus.</i>

DAFFODILS FOR POT CULTURE.

Victoria.	Empress.
Emperor.	Firebrand.
Golden Spur.	Henry Irving.
Madame de Graaff.	Queen of Spain.
Sir Watkin.	Lucifer.
Blackwell.	Olympia.
Weardale Perfection.	Aspasia.
Seagull.	King Alfred.
W. P. Milner.	<i>obvallaris.</i>
<i>Barrii conspicuus.</i>	<i>poeticus ornatus.</i>

DAFFODILS FOR CUTTING.

Sir Watkin.	<i>poeticus ornatus.</i>
<i>Barrii conspicuus.</i>	Weardale Perfection.
Golden Spur.	Argent.
Emperor.	Seagull.
Horace.	Frank Miles.
White Lady.	Blackwell.
Empress.	Firebrand.
Madame de Graaff.	Henry Irving.
Lucifer.	Lady Margaret Boscawen.
King Alfred.	Albatross.

DAFFODILS FOR THE ROCK GARDEN.

<i>minimus.</i>	<i>minor.</i>
<i>cyclamineus.</i>	<i>triandrus calathinus.</i>
W. P. Milner.	<i>Bulbocodium conspicuus.</i>
<i>triandrus albus.</i>	<i>Macleayi.</i>
Queen of Spain.	<i>pallidus praecox.</i>
<i>juncifolius</i>	<i>gracilis.</i>
<i>moschatus.</i>	Eoster.
<i>nanus.</i>	Lulworth.
<i>Bulbocodium citrinus.</i>	<i>capax plenus.</i>
Bennett Poë.	

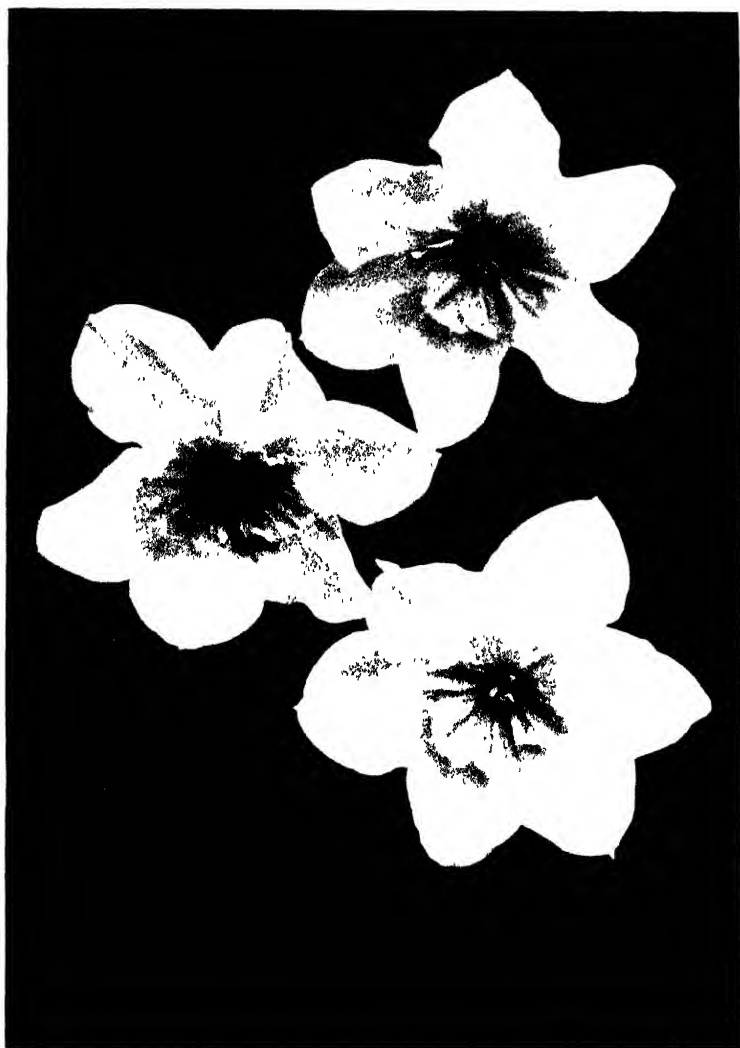


FIG. 78.—NARCISSUS 'IVORINE' (p. cliv.)

Ho-tace p. cliv.

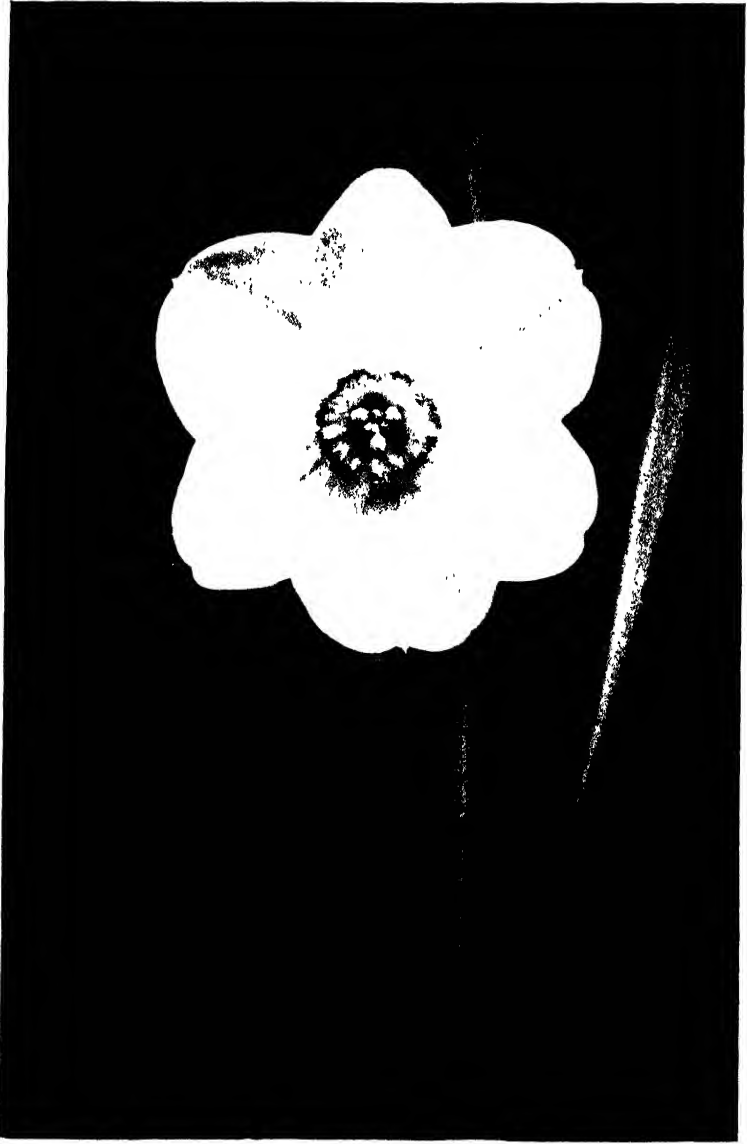


FIG 79 —NARCISSUS 'NIGHTINGALE' (p. clv.)



FIG. 80. NARCISSUS 'MORVEN' (p. clv.)

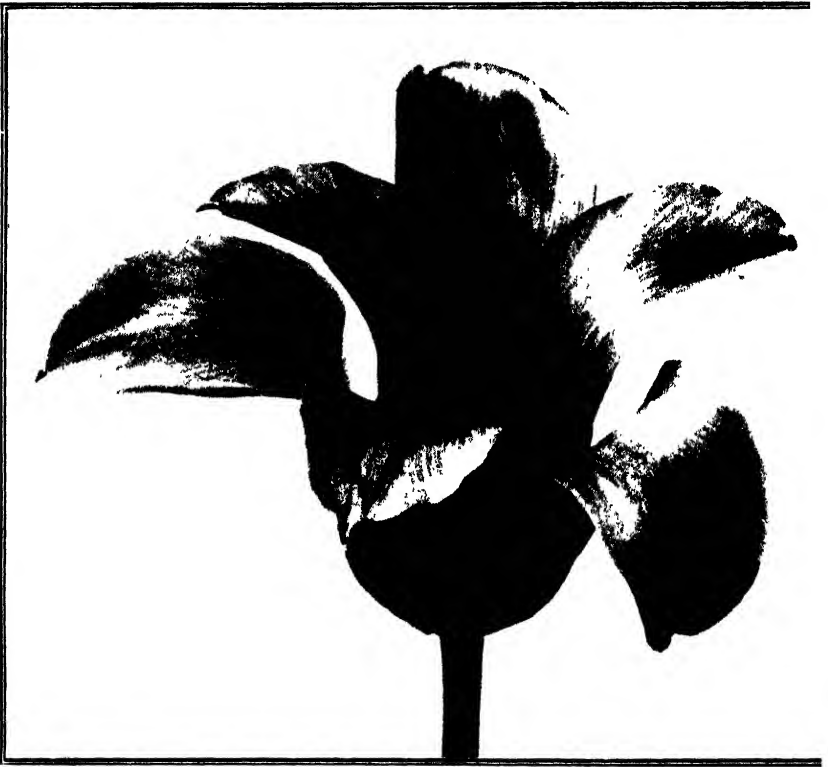


FIG. 81 -TULIP 'SIREN' (*Gardeners' Magazine*) (p. clvii)

[To face p. 10]

ESTABLISHED
1804

INCORPORATED
1809

TELEGRAMS
"HORTENSIA
SOWEST LONDON "



TELEPHONE
VICTORIA 5363.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S W.

NOTICES TO FELLOWS.

- | | |
|--------------------------------------|--|
| Hour of Shows closing. | 15. Distribution of Surplus Plants. |
| 1. General. | 16. Trials at Wisley. |
| 2. Letters. | 17. Savillage Conference, 1915. |
| 3. Telephone and Telegrams. | 18. National Diploma in Horticulture. |
| 4. Journals Wanted. | 19. Examinations, 1915. |
| 5. Subscriptions. | 20. Information. |
| 6. Form of Bequest. | 21. Inspection of Fellows' Gardens. |
| 7. Privileges of Chemical Analysis. | 22. Affiliation of Local Societies. |
| 8. List of Fellows. | 23. Rules for Judging—1914 Code. |
| 9. New Fellows. | 24. Rules for Judging Cottage and Allotment Gardens. |
| 10. An Appeal. | 25. Disbudding of Orchids. |
| 11. R H S. Gardeners' Diary. | 26. Disbudding Chrysanthemums. |
| 12. The Society's Gardens at Wisley. | 27. Shirley Poppies. |
| 13. Rock Garden at Wisley. | 28. Advertisements. |
| 14. Students at Wisley. | |

HOUR OF SHOWS CLOSING.

The experiment was made of keeping the Shows open till 7 P.M. in summer and 6 P.M. in winter. It cannot be said that Fellows have appreciated or taken advantage of this hour's increase, and now that we are bidden to show no lights in the dusk, the Shows will close at 5 P.M. or 4.30 P.M. in November to February.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report

CLX PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

of the Council." Fellows are requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.; except those specially connected with Wisley—see p. clxii.

3. TELEPHONE AND TELEGRAMS.

Telephone Number : **VICTORIA 5363.**

"HORTENSIA SOWEST LONDON" is sufficient address for telegrams. This address counts as two words only.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of any numbers of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted :—

Vols. I. to VI.

Vol. XIII. Part 1.

Vol. X.

Vol. XIV.

These are, therefore, particularly asked for.

5. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays the full amount of his subscription for the year commencing the 1st day of January then next, and no further subscription until the next succeeding 1st of January. To avoid the inconvenience of remembering their subscriptions Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society;

but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £....., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

See page 117 in the "Book of Arrangements," 1914.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once.

9. NEW FELLOWS.

The increasing number of Fellows shows plainly the useful work the Society is doing, and its value to all lovers of the Garden. The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as it is most important to fill the places of those who are taken from us.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Providing Lectures with Lantern Slides.
3. Presenting Books for the Library at Vincent Square and at Wisley.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

4. Sending new or rare Plants and Seeds for the Garden and surplus Roots for distribution to the Fellows.

The Secretary asks for help in the ways above indicated.

11. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1915 contains a considerable quantity of new information, and is compiled more especially for the single-handed gardener. Fellows may obtain it post free, 1s. 1d., from the R.H.S. Office, Vincent Square, London, S.W.; or 2s. 1d. if leather-bound. Non-Fellows should apply to Messrs. Wesley, 28 Essex St., W.C.

12. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the last Annual Meeting for the further development of the practical and scientific work at Wisley, Fellows will be pleased to know that the Council have been fortunate in securing the services of Dr. Keeble, F.R.S., as Director, and of Professor Lefroy of the Imperial College as Entomologist. Other appointments are being considered with a view of securing a thoroughly competent staff to make Wisley the foremost horticultural institution of its kind in the British Empire. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of the Society and the Imperial College. All communications to the Gardens should in future be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

Mr. F. J. Chittenden, F.L.S., who has done such splendid work in the Laboratory and with the Students since 1907, will still continue in this capacity under the re-organization scheme, and Mr. Wright will similarly continue his work in the Garden.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about $3\frac{1}{2}$ miles from Byfleet, $3\frac{1}{2}$ miles from Horsley, and $5\frac{1}{2}$ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8s.; or waiting three hours, 10s.; or to and from Horsley, Effingham, or Byfleet, 7s. Motor cars will be found at Byfleet Station. Accom-

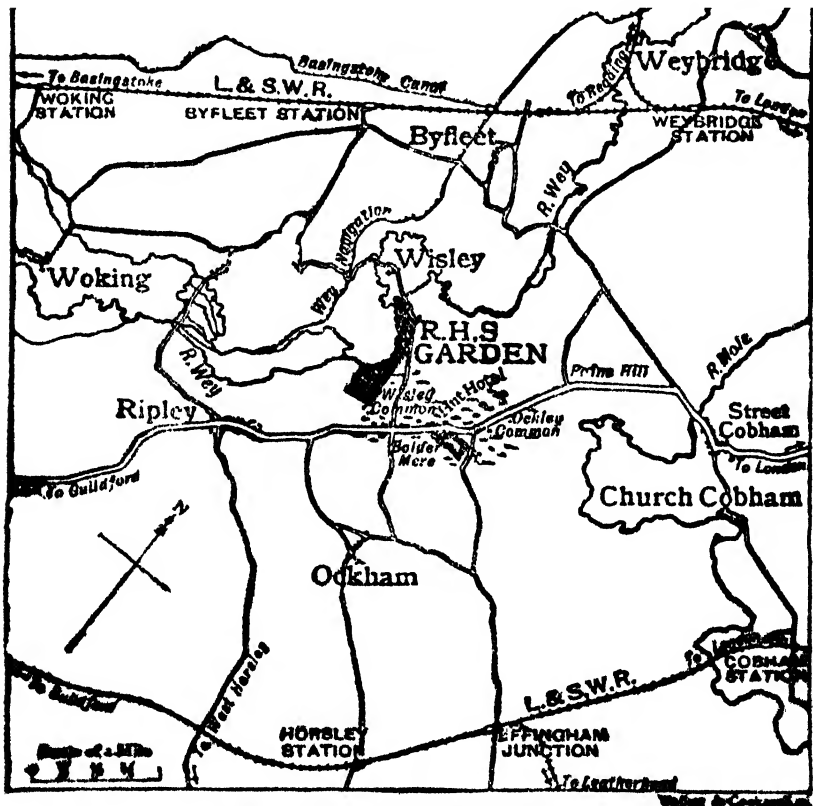
modation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy, Ockham.

For the motor route from London, 21 miles from Hyde Park Corner, see "Book of Arrangements," p. 157.

13. ROCK GARDEN AT WISLEY.

In response to the interest taken in what are popularly called "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that.

An Alpine House has been built above the Rock Garden, for the purpose of growing rock plants to perfection which blossom too early to withstand our wet winters and late spring frosts.



POSITION OF THE SOCIETY'S GARDENS.

14. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

15. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded ; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants ? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the " Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot ; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out

of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries ; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

16. TRIALS AT WISLEY, 1915-16.

N.B.—Everything sent for trial *must be named*, and the name and address of the sender attached, together with the name of the raiser and introducer as far as known.

Intending senders should apply to the Director, R.H.S. Gardens, Wisley, Ripley, Surrey, at an early date for forms of entry, one of which will be required for each variety or sample sent for trial.

FLOWERS.

Annual Sunflowers.—Twenty seeds of each to be sent by February 20.

The following trials are being continued :

Winter Flowering Sweet Peas, Irises, and Perennial Phloxes ; and for nomenclature purposes Tulips, Pentstemons, and scented Pelargoniums. For the present no further stocks of any of these are desired.

VEGETABLES.

Early and Midseason Potatos.*—Twenty tubers of each to be sent by February 20.

Early Peas.—Half pint of each to be sent by February 20.

Autumn Cabbages.—One packet of each to be sent by February 20.

Parsnips.—One packet of each to be sent by January 30.

SUNDRIES.

Winter Washes for Fruit Trees.—Quantity sufficient for a fair trial to be sent by November 20, 1914.

* As indicated on the form circulated to senders the locality of origin of the seed and the nature of the soil on which it was grown must be stated.

All articles for the above trials must be marked "Specimens for Trial," and addressed :

If by post : The Director, R.H.S. Gardens, Wisley, Ripley, Surrey.

If by rail : The Director, R.H.S. Gardens, Wisley, Horsley Station, L. & S.W. Ry., with advice by post to the Director.

TRIAL OF TULIPS, AND ARRANGEMENT OF NOMENCLATURE.

In the autumn of 1913 an invitation was issued to the leading growers to send to Wisley for trial bulbs of their varieties of Tulips, with the names under which they respectively knew them. These were planted at Wisley, and on Monday, April 20, a joint committee of Dutch and English experts met to consider the early varieties ; and again on May 6 and 7 to consider the May-flowering varieties.

Over 4000 were examined, and their nomenclature and synonyms determined.

The trials of the May-flowering varieties only will be continued in 1915, and growers have been invited to send fresh bulbs—five of each variety—named. Bulbs sent later than November 1 cannot be accepted. Senders were asked to designate the colour of their flowers and the class to which they belong, to facilitate the work of planting.

The Committee drew up recommendations for a classification. These will be reconsidered at a Conference to be held at Vincent Square on May 13 and 14, 1915, when it is intended to prepare the final list of varieties and synonyms and all recommended varieties will be placed in one or other of the sections and sub-sections of the classification.

This final list, with official descriptions, will be printed and published by, and at the expense of, the R.H.S. in conjunction with the Dutch Bulb Growers' Society in Haarlem.

To make the descriptions short and clear, certain typical varieties will be selected, described, figured, and named, so that others can be described by reference to them. Thus systematized, the colour, shape, base, and the relative length and breadth of the inner segments will be recorded.

TULIP SHOW.

A Show of May-flowering Tulips will be held in May 1915, cut blooms only, for the purpose of enabling the Nomenclature Committee to decide on the synonyms of the varieties sent.

1. R.H.S. Medals will be given to collections and Awards made to species and varieties at the discretion of the Council.

2. May 12.—The Hall will be available for staging at Noon.

May 13.—Staging must be completed by 9 A.M. when the Committee will commence their work. The Committee *only* will be allowed in the Hall on the 13th.

May 14, at 9 A.M.—Committee will continue their work. At 11 A.M., private exhibitors and two members of each exhibiting firm will be admitted, but no one else. At 1 P.M., R.H.S. Fellows will be admitted by their tickets, and the public on payment of 1s.

3. A full collection of standard varieties of May flowering varieties will be brought from Holland for comparison.

4. All British growers are invited to send blooms.

TRIAL OF HORTICULTURAL SUNDRIES.

The Council will continue the Trial of Sundries in 1915, and Sundriesmen are again invited to send their specialities (not more than three articles in any one year). Full particulars, with Entry Form, can be obtained from the Director, R.H.S. Gardens, Wisley, Ripley, Surrey, upon receipt of a stamped addressed envelope.

17. SAXIFRAGE CONFERENCE, 1915.

In consequence of the War the Conference on Saxifrages announced for April 28, 1915, will be postponed.

18. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners will welcome the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations which will be required. The Diploma will be thoroughly "National," for by the consent of H.M. Government, the Department of Agriculture, after being approached on the matter, consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized that the Diploma should bear the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations will be practical, viva voce, and written. The practical part will be held in suitable gardens at convenient centres in the country. A Preliminary Examination, the first, was held in June 1914, and will be held annually. The first Final Examination will be held in June 1915 about the same time as the second Preliminary. The Final is open only to those who have passed the Preliminary the year before and can produce a Certificate showing they have been employed regularly for not less than six years in the Practice of Horticulture.

Among those for whose benefit the Diploma is established are the following:—Florists, Fruit Growers, Gardeners, Horticultural Inspectors, Horticultural Instructors (not School Teachers giving

instruction in other subjects), Landscape Gardeners, Market Gardeners, Nurserymen, Public Park Gardeners, and Seedsmen.

Fuller information may be obtained from the Secretary, Royal Horticultural Society, Vincent Square, S.W.

19. EXAMINATIONS, 1915.

1. The Annual General Examination in the Principles and Practice of Horticulture will be held on March 31, 1915. It has two divisions, viz. (a) for Candidates of eighteen years of age and over, and (b) for Juniors *under* eighteen years. Particulars for 1915 may be obtained by sending a stamped and directed envelope to the Society's offices. Copies of the Questions set from 1893 to 1914 (price 2s. post free) may also be obtained from the office. The Society is willing to hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Royal Horticultural Society, to be awarded after the 1915 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 14, 1915. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The conduct of this Examination is on similar lines to that of the General Examination. Questions on Elementary Chemistry and Biology are included.

Medals and Certificates are awarded and Class Lists published in connexion with these Examinations.

20. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is

particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

21. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3s. for one day (or £5 5s. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the *owner*.

22. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 330 Societies have joined our ranks, and the number is steadily increasing.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3s. 6d. for 10 copies, 5s. 6d. for 20, 11s. 6d. for 50, 20s. for 100. At the request of several of the Affiliated Societies, the Council have had the Certificate Card coloured. The coloured Card is sold at 8d. a single copy, or 10 for 5s., post free.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5s. 6d., with case complete; Silver, 12s. 6d., with case complete; Silver-gilt, 16s. 6d., with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6d. each.

23. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. It contains a useful Index and several important amendments. Special attention is drawn to the new "Rules for Judging Cottage and Allotment Gardens," with the companion "Judges' Point Sheet" (see paragraph 24), and a "Classification of Stove, Greenhouse, and Hardy Plants

for Show Purposes." The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1s. 6d., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

24. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at twopence a copy, or fifty for 7s. 6d.

A companion Judges' Sheet in a very convenient book-like form can also be had for 2s. a dozen. This Judges' Sheet has, in tabulated form, a list of the subjects usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given.

25. DISBUDDING OF ORCHIDS.

At the request of the Orchid Committee the Council have made a rule that "Awards will not be given to any Orchids of which the natural size and character of the flowers have, in the opinion of the Orchid Committee, been in any way changed or improved through the removal of a bud or buds, or part of the spike."

26. DISBUDDING CHRYSANTHEMUMS.

When single-flowered Chrysanthemum plants are submitted for certificate one plant must be shown without any disbudding whatsoever, and one plant somewhat disbudded, in order that the quality of the blooms on the undisbudded stems may be compared with those on the disbudded stems.

27. SHIRLEY POPPIES.

The Rev. W. Wilks will be pleased to send a packet of his 1914 crop of seed to any Fellow who likes to send him, to *The Wilderness, Shirley, Croydon*, a stamped envelope ready addressed to himself. The stock this year is but small. Applicants receiving no reply within a few days may conclude that the supply is exhausted. This offer is made by the Secretary in his private capacity and no attention can be paid to any requests for seed unless sent as directed above.

28. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

EXTRACTS FROM THE PROCEEDINGS
OF THE
ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

SEPTEMBER 8, 1914.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (4).—A. H. Moss, M.A., E. Moon, F. M. Petch, Mrs. Wilder.

Fellow resident abroad (1).—Mrs. J. Willis Martin (Philadelphia).

A lecture on "Lawns and their Up-keep" was given by Mr. James McDonald (see p. 372).

GENERAL MEETING.

SEPTEMBER 22, 1914.

F.M. LORD GRENFELL OF KILVEY, G.C.B., G.C.M.G., in the Chair.

Fellows elected (14).—H. W. Bane, F. E. Bond, Mrs. Cooper, H. E. Dunstan, J. W. Knapp, J.P., T. F. Marriner, F. Miller, W. H. Pedder, Mrs. F. Pritchard, H. G. Purvis, J. T. Slater, L. Stilliard, R. W. Thompson, B. E. Williams.

Fellow resident abroad (1).—J. F. L. Lamport.

Associates (3).—L. W. Apps, A. Jenkins, Miss Monica Sumner.

Society Affiliated (1).—Rudgwick and District Hort. Soc.

GENERAL MEETING.

OCTOBER 6, 1914.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (11).—Mrs. C. V. Boyle, A. G. V. Cady, W. J. Guy, F. C. Hill, Miss C. M. Minton-Senhouse, P. H. Morton, W. Phorley, Miss C. A. Prater, G. W. Reynolds, J. Stewart, Miss N. Turner.

Society Affiliated (1).—Abetaman Hort. Soc.

A lecture on "The Art of Informal Gardening" was given by Mr. James Hudson, V.M.H. (see p. 361).

GENERAL MEETING.

OCTOBER 20, 1914.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (9).—Miss A. E. Clark, Mrs. W. F. Dew, J. Fleming, Mrs. Leitner, Capt. H. Lockwood, Mrs. D. McNeill, Miss A. Stevens, C. M. Temb , Mrs. Stuart Todd.

Associate (1).—Miss E. M. Sykes.

A lecture on "Vegetable and Human Mechanics Compared" was given by the Rev. Prof. G. Henslow, V.M.H. (see p. 381).

GENERAL MEETING.

NOVEMBER 3, 1914.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (14).—Mrs. H. P. C. Austin, J. S. Ballin, C. W. Everard, Miss J. Evershed, J. S. Henderson, G. H. Lamacraft, Mrs. Leighton, G. H. Oatway, B. P. Perry, Miss E. A. Rogers, Mrs. Rothwell, Mrs. L. T. Rowe, P. Steer, E. F. Stranack.

Fellows resident abroad (2).—Mrs. Francis King (Michigan, U.S.A.), G. B. Patwardhan, B.Sc. (Kirkee, India).

A lecture on "Some useful Books for an Amateur Gardener's Library" was given by Mr. E. A. Bowles, M.A. (see p. 401).

BOURNEMOUTH HORTICULTURAL SOCIETY'S AUTUMN
EXHIBITION.

NOVEMBER 10, 1914.

A DEPUTATION, consisting of Sir Harry Veitch, V.M.H., the Rev. W. Wilks, M.A., V.M.H., and Mr. S. T. Wright, Superintendent of the Wisley Gardens, visited the Bournemouth Autumn Flower and Fruit Show on Tuesday, November 10.

W. Child Clark, Esq., very kindly invited the Deputation to dine with him on Monday, 9th, when a most enjoyable evening was spent by all present.

On Tuesday, 10th, the Deputation visited the Show. They found the exhibits of excellent quality, and made the undermentioned awards.

After their inspection of the Show the Deputation, together with the Officers of the Bournemouth Society, were entertained at luncheon at the Royal Bath Hotel on the kind invitation of Sir Daniel Morris,

Silver Cup.

To E. G. Mocatta, Esq., Woburn Place, Addlestone (gr. T. Stevenson), for Chrysanthemums.

To Captain F. J. Dalgety, Lockerley Hall, Romsey (gr. W. Baxter), for Japanese incurved Chrysanthemums.

To Messrs. G. Watts, Bournemouth, for a group of miscellaneous plants.

Silver-gilt Flora Medal.

To Mr. J. Stevenson, Wimborne, for miscellaneous plants, &c.

To Messrs. Cypher, Cheltenham, for Orchids.

To Messrs. Stuart Low, Bush Hill Park, Middlesex, for Carnations and Orchids.

Silver-gilt Banksian Medal.

To Sir Randolph Baker, Bt., Ranston, Blandford (gr. A. E. Usher), for Carnations.

To The Park Nurseries, Bournemouth, for miscellaneous plants.

To Messrs. Veitch, Exeter, for fruit and flowers.

Silver Flora Medal.

To Hugh Andrews, Esq., Toddington Manor, Winchester (gr. J. R. Tooley), for Japanese Chrysanthemums.

To Major Wyndham Pain, of Bransgore (gr. P. Kitcher), for Japanese Chrysanthemums.

To Mr. M. Prichard, Christchurch, for Saxifrages.

Silver Knightian Medal.

To Hugh Andrews, Esq., for Grapes.

To Mr. G. H. Copp, Boscombe Grove Road, for vegetables.

Silver Banksian Medal.

To Sir Randolph Baker, Bt., for Apples.

To Major Chichester, Embley Park, Romsey (gr. W. Hall), for White Grapes.

To Mr. J. H. Cape, Ferndown, for Apples.

GENERAL MEETING.

NOVEMBER 17, 1914.

Dr. F. KEEBLE, F.R.S., in the Chair.

Fellows elected (6).—Mrs. A. Norman Dugdale, G. W. Hinchley, G. Johnson, J. Dyfri Jones, Mrs. H. McCalmont, J. F. MacKellar.

A lecture on "The Cultivation of Carnations in Pots" was given by Mr. William H. Cutbush, (see p. 389).

GENERAL MEETING.

DECEMBER 1, 1914.

Sir HARRY J. VEITCH, F.L.S., V.M.H., in the Chair.

Fellows elected (6).—D. Edwards, A. Machin, Capt. W. Stackhouse Pinwill, V.M.H., Col. H. E. Rawson, C.B., Sir Shirley H. Salt, Bart., Miss C. Tite.

Fellows resident abroad (2).—M. Free (Brooklyn, U.S.A.), S. K. Sen (Calcutta).

GENERAL MEETING.

DECEMBER 15, 1914.

Sir HARRY J. VEITCH, F.L.S., V.M.H., in the Chair.

Fellows elected (21).—Lady Arrol, B. W. Baker, Mrs. H. Bright, Miss M. Bromley, Miss Clarke, L. A. Davey, Miss E. de Steiger, B. Fletcher, Rev. T. Glaisyer, Col. Sir Swinton S. Jacob, K.C.I.E., C.V.O., Mrs. D. H. Kennedy, Mrs. Kensington, Mrs. F. C. Lindo, G. Maclean, J. W. Maybury, Miss E. Lanigan O'Keefe, Mrs. C. W. Randall, Miss G. G. Redwood, J. S. Spink, F. B. Steel, Mrs. M. Townsend.

Associate (1).—Miss H. E. Burr.

Society Affiliated (1).—Abergele Hort. Soc.

SCIENTIFIC COMMITTEE.

SEPTEMBER 8, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Insect on Bay Leaves.—Mr. E. M. Holmes, F.L.S., reported that the *Lecanium* on the leaves of Bay was *L. hesperidum* Linn. = *L. Lauri* Signoret. There seems no difference between the two, except that they occur on different plants.

Gall on Gerbera nov. spec.—Mr. W. C. Worsdell, F.L.S., showed a leaf of a pink-flowered *Gerbera* from the Transvaal, with galls on the veins.

Pelargonium hybrid.—Mr. J. Fraser, F.L.S., showed living specimens of a natural hybrid between *P. denticulatum* 'Stella' (male parent) and *P. quercifolium minus* (female parent). He exhibited dried specimens of the parent forms. The crossing had been effected by bees.

Pancratium canariense.—Mr. A. Worsley showed a "spike" from one of the seedlings of this plant raised by him. He has also succeeded in crossing the species with *P. maritimum*.

Dahlia Stem Eaten by Wasps.—Mr. Holmes exhibited a piece of stem, the fleshy cortical part of which, on one side, had been devoured by the common wasp (*Vespa vulgaris*), specimens of which were brought, showing them to be workers, not drones.

Papaver orientale × *P. somniferum*.—Mr. E. A. Bowles exhibited a supposed hybrid plant of this nature from Mr. Perry's garden. Mr. Perry had made a sowing of his white variety of *P. orientale*, amongst which a few plants of *P. somniferum* and a few of the hybrid had appeared, the majority coming true. The hybrid is infertile, and has so far proved to be hardy. It is a perpetual flowerer. Evidence of the presence of *P. somniferum* blood is found in the shiny, rather glaucous character of the leaves.

Rose Galls.—Mr. Bowles brought some small Rose galls from the Alpes-Maritimes.

SCIENTIFIC COMMITTEE, SEPTEMBER 22, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and five members present.

Sawfly on Viola.—Mr. Bowles said he had received a letter from Mr. F. D. Morice, of Woking, concerning the sawfly larvæ which he had found feeding on Violet. He thought they were probably the larvæ of *Iaxonus glabratus*, a small purplish-black insect with red legs, which is widely distributed, and does not feed exclusively on Violas.

Origanum species.—Mr. J. Fraser, F.L.S., showed specimens of *Origanum* which he had been growing, and pointed out that some confusion had apparently arisen with regard to the habit and duration of some of the species. Mr. E. M. Holmes, F.L.S., who has given particular attention to this genus, took some of the specimens for further examination and report (see p. clxxviii).

Two-podded Sweet Pea.—A photograph of an inflorescence of Sweet Pea was received, from which it was evident that one flower had produced two pods arising from distinct carpels. They both appeared to occupy an anterior position, but this could not be certainly determined.

SCIENTIFIC COMMITTEE, OCTOBER 6, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Hybrid Saxifrage.—Mr. J. Fraser, F.L.S., showed a hybrid Saxifrage which had appeared in his garden, evidently a cross between *S. granulata* and one of the mossy Saxifrages, probably *S. Rhei*. It produced leaves in autumn somewhat intermediate between those of its putative parents. The inflorescence is about 12 inches in height, and the white, cup-shaped flowers are tinted with red.

Sempervivum chrysanthum.—Mr. A. Worsley showed an inflorescence of this plant, and remarked that apparently two forms are grown in gardens under this name, one having lateral inflorescences only, the other a large terminal inflorescence.

Malformation in Pinus Thunbergii.—Mr. W. C. Worsdell, F.L.S., exhibited a curious growth of this Pine from Sir Edmund Loder's garden at Leonardslea, in which the normal foliage spurs were replaced by recurved fleshy scale leaves, and in some cases by a pair, probably homologous with the paired ovuliferous scales of the Pine cone. Here and there an abortive female cone occurred. A fungus was present in all parts of the shoot, and this had probably induced the malformation.

Black Apple.—Mr. I. A. Walker, of Woodberry, Sydenham Hill, S.E., sent a perfectly black apple. Only once before has an Apple having this appearance been shown before the Committee, and on that occasion Dr. M. C. Cooke attributed the appearance to an attack of the fungus *Sclerotinia fructigena* (= *Monilia fructigena*), the cause of brown rot of various fruits.

SCIENTIFIC COMMITTEE, OCTOBER 20, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and seven members present.

Lachnus viminalis.—Mr. J. Fraser showed specimens of this very large species of aphid, which attacks various Willows and is very destructive to them.

Willow Seedlings.—Mr. Fraser remarked that it had been reported that Willow seed rarely or never germinates, but he produced considerable evidence in the form of seedlings to show the contrary is the case. A constant supply of moisture and the absence of competition with tall herbaceous plants are necessary to the success of the young Willow seedlings, but given these conditions the seed germinates readily when fresh. He had found seedlings of *Salix repens* (seeds of which will germinate within forty-eight hours of sowing), *S. alba*, *S. viminalis*, *S. Lapponum*, *S. Caprea*, *S. cinerea*, *S. aurita*, *S. nigricans*, *S. phylicifolia*, *S. Arbuscula*, and *S. lanata*. He showed beautifully dried specimens of all but the last of these.

Variegation in Dandelion.—Mr. A. Worsley showed a variegated Dandelion which had appeared in his garden. The variegation took the form of light yellow patches here and there on the foliage, both young and old leaves being affected. He took the plant to ascertain whether the variegation would appear in another year.

Curious Teasel.—Mr. E. A. Bowles showed a curious head of *Dipsacus Fullonum*. It had been noticed while the plant was growing that the flowers had begun to open at the base of the inflorescence first instead of in the middle as usual, and foliose bracts had developed at the top of the stem in a tuft very similar to the crown of the Pineapple on a small scale. Mr. W. C. Worsdell took the specimen to examine further (see below).

Malformed Walnut.—Mr. Bowles also showed a curious Walnut, the apex of which was drawn out to a point; it was one of six that had been found in a field at Enfield.

SCIENTIFIC COMMITTEE, NOVEMBER 3, 1914.

MR. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Teasel malformed.—Mr. W. C. Worsdell, F.L.S., stated that he had examined the Teasel head shown by Mr. Bowles at the last meeting and had found, besides the peculiarities mentioned then, proliferation and branching into secondary heads (still of small size) at the apex (see above).

Hybrid Willows.—Mr. J. Fraser, F.L.S., showed a series of beautifully prepared specimens of *Salix* hybrids, mostly collected in Surrey, and between the species *cinerea*, *aurita*, and *viminalis*.

Lobing of Oak leaves.—Mr. J. T. Bennett-Poë, V.M.H., showed some very deeply lobed leaves of *Quercus Cerris*, the divisions reaching nearly to the midrib.

Bifurcation of leaves.—Mr. E. A. Bowles drew attention to forked terminal leaflets of the Common Ash, and to a forked leaf of *Rhus cotinoides* which he exhibited. Mr. Fraser said that similar bifurcation was frequent in leaves of *Ulmus campestris* var. *viminalis*.

Origanum Marjorana, &c.—Mr. E. M. Holmes, F.L.S., having now completed his examination of the Marjoram shown by Mr. Fraser on September 22 (p. clxxvi), reported as follows :—

“ The plant is identical with a species received from Cyprus as *Origanum* and examined at the Imperial Institute,* where its volatile oil was found to contain 84 per cent. of carvacrol, a substance not found in the oil of *Origanum Marjorana*. The plant was examined by me and reported on in the *Pharmaceutical Journal* for September 1907, p. 378, and elsewhere.† I referred the plant to *Origanum marjoranoides* of Willdenow, which is distinguished from *O. Marjorana* by its woody stem and perennial habit, by the flowerhead being sessile at the top of the common peduncle, and by the hoary leaves.

“ Dr. O. Stapf considers that it is identical with the *Origanum dubium* of Boissier, who states that there are two minute teeth at the base of the calyx. These are not present in Boissier’s own specimens, according to Dr. Stapf, nor are they in the Cyprus *Origanum*.

“ Willdenow’s specimen is in the Berlin Herbarium, and I have not been able to see it. Whether his plant is identical with Boissier’s *O. dubium*, and whether *O. dubium* yields an oil containing carvacrol, has not been ascertained, but that the Cyprus *Origanum* is not identical with *O. Marjorana* may be regarded as certain, since the volatile oil of the latter contains no carvacrol. Probably Mr. Fraser’s plant was raised from seeds of the plant sent from Cyprus, of which I distributed some seeds.”

Pear × Quince.—Mr. J. C. Allgrove, of the Langley Nursery, showed several fruits of the Pear raised by Mr. John Seden from the Pear ‘ Bergamotte Esperen ’ crossed with pollen from Portugal Quince (see JOURNAL R.H.S., Vol. XXXIII. pp. clxvii, clxxi). The fruits of this type are essentially Pears, very similar in shape and appearance to ‘ Easter Beurre,’ very short-stalked, roundish, and plentifully dotted all over with large dots. The flavour is good and the Pear ripens long before its Pear parent ‘ Bergamotte Esperen,’ being fit to eat at the end of October. It will be remembered that the other plant raised from the same fruit was quince-like in form, and never becomes soft.

Curiously-marked Apple.—Mr. E. M. Holmes showed a small fruit of Apple ‘ Cox’s Orange Pippin ’ with a segment of about one-fifth of the normal red colour of that variety, the remainder being green, and the lines of demarcation being very sharply defined. This is no doubt due to somatic segregation of the characters upon which colour production depends, and is similar in kind to the phenomena grouped under the term “ bud variation,” and to the results seen in parti-coloured flowers.

* *Bull. Imp. Institute*, 1906, vol. iv. pp. 207, 297.

† *Perfumery and Ess. Oil Record*, February, 1913, p. 41, c. fig.

SCIENTIFIC COMMITTEE, NOVEMBER 17, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Alien plants.—Mr. J. Fraser, F.L.S., showed dried specimens of *Sisymbrium austriacum*, a native of Central and S. Europe, closely allied to *S. Irio*, and of *S. pannonicum* (*S. altissimum*), which he had found growing on rubbish heaps. These plants do not, as a rule, maintain themselves for long in a wild state.

Maize cobs malformed.—Mr. W. C. Worsdell, F.L.S., showed Maize cobs brought from Nyasaland by Mr. E. W. Davy, one of which had three or four narrow lateral cobs arising from the base and growing apparently in the axils of the lower bracts; the other was curiously fasciated at the apex. The latter was particularly curious, as the common view of the Maize cob is that it arises by fusion of several axes, and the specimen shown might have been expected to exhibit the fasciation throughout its whole length.

Araucaria imbricata attacked by fungus.—Mr. A. Worsley showed a fruit of the fungus *Fomes applanatus* from a tree of *Araucaria imbricata* growing in his garden. The tree had been damaged some years ago near the base, and the fungus had no doubt gained an entrance through the wound. It is a common parasite of Pines.

Dendrobium Toftii.—A Botanical Certificate was unanimously recommended to *Dendrobium Toftii*, a native of Queensland, and allied to *D. taurinum*, shown by Sir Jeremiah Colman, Bt., V.M.H., referred to this Committee from the Orchid Committee. Its flowers are borne at the apex of a leafy pseudo-bulb.

Calanthe \times *Branchii*.—This interesting hybrid between the ever-green *Calanthe Textori* and the deciduous *C.* \times 'Bryan var. Wm. Murray,' was shown by Mr. C. J. Lucas, Warnham Court. Its habit was that of *C. Textori*, while the inflorescence was like that of its other parent. The broad-leaved growths were swollen at the base. It followed the latter also in the size of its flowers, which were somewhat less bright than those of 'Wm. Murray,' but coloured and much larger than those of *C. Textori*. A Certificate of Appreciation was recommended to Mr. Lucas for the work done in making this interesting cross, and a Botanical Certificate to the plant.

Seedless fruits of Aegle sepiaria.—Mr. E. A. Bowles showed ripe fruits of *Aegle sepiaria* which had ripened outdoors, but which, though of normal size, contained no seeds. In ordinary seasons fewer fruits are produced, and they usually fail to ripen outside, but contain good seed, which readily ripens indoors.

SCIENTIFIC COMMITTEE, DECEMBER 1, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and twelve members present.

Dianthus barbatus spirally contorted.—Mr. J. Fraser, F.L.S., showed a photograph of *Dianthus barbatus* with its stem spirally contorted and the leaves displaced from their usual opposite and decussate position to a spiral arrangement.

Pelargonium hybrids.—Mr. Fraser also showed specimens of *Pelargonium* × 'Unique' and *P.* × *conspicuum*, and made remarks upon them which will be embodied in his report.

New Plant.—Mr. W. C. Worsdell, F.L.S., showed a dried shoot which he had collected in South Africa, probably in the Transkei, with male flower. It was not referable to any known genus, but showed closest affinities with the Sapindaceae, though apparently not very nearly allied to either of the recognized sections of that family. The leaves are pinnate, and the disc of the male flowers very highly developed.

Isoloma with supernumerary petals.—Mr. A. Worsley showed flowers of an *Isoloma* which always produced more than the normal number of petals. He had pollinated the original parent *Isoloma* with pollen from a *Gloxinia* with more than five petals, and of the seventy plants raised this was the only one showing any difference from the normal *Isoloma*. It was constantly sterile, unlike the majority of *Isolomas*.

Black-fellow's Bread.—Dr. A. B. Rendle, F.R.S., showed a specimen of the material known as black-fellow's bread which he had picked up in Gipps Land, Australia. It was globular, reddish-brown, hard and solid, weighed about 3 lb., and was about 6 inches in diameter. The material has been known for some time, and was recognized as of fungus origin by Berkeley, who thought it to be related to the truffles, and named it, in 1839, *Mylitta australis*. Later, specimens were sent to Dr. Cooke showing it to be a sclerotium, and bearing fructifications which enabled Dr. Cooke to assign it to its proper position. He named it *Polyporus Mylittae* (1892). The sclerotia vary in size from that of a pea or hazel nut to that of a man's head, and specimens weighing 39 lb. and 50 lb. respectively have been recorded. The consistency when fresh is that of cheese or stiff gelatine, but on exposure to air it hardens and becomes quite horny. Its structure is that of the ordinary sclerotium, with multitudes of interlacing hyphæ. It is eaten by the aborigines, but has little nutritive value, containing no starch or nitrogen, and only a small quantity of pectase. It is somewhat like rice or tapioca to the taste, with a decided flavour of coconut when fresh; when toasted it is not unlike passover cake. As growth proceeds it raises and cracks the soil, which leads to its discovery.

Callipsyche aurantiaca.—Mr. W. E. Ledger showed an inflorescence

of this uncommon Amaryllid, native of the Andes of Ecuador, the flowers of which are at first green, changing to bright yellow, and have much exserted stamens, the filaments being double the length of the long tubular perianth. It is figured in *Refugium Botanicum*, t. 167.

Peculiar Oak leaves.—Mr. E. A. Bowles showed oak leaves with extremely narrow, almost linear lobes. No member of the Committee had seen lobes of this character before, and watch will be kept to see whether the occurrence of this kind of foliage is persistent. (This was subsequently identified by Dr. A. Henry as an uncommon variety of *Quercus pedunculata* called *scolopendrifolia*.)

Snowdrop with stem.—Mr. Bowles showed some snowdrop bulbs produced at the apex of a stem about $\frac{1}{2}$ inch in length, which had apparently proceeded from the base of the old bulb. It was thought probable that the occurrence of this stem was due to the late date at which the bulbs had been planted in stiff loam, bringing about an aberration of growth.

Variegated Erodium cicutarium.—Mr. F. J. Chittenden showed leaves of a variegated *Erodium cicutarium* from his garden.

Growth of Apple Trees.—He also produced figures showing the average growth made by different varieties of bush apple trees on Paradise and Crab stocks in each of three years, half of which trees had been pruned in the season of planting, and half not, subsequent pruning being done to all annually so as to shape the trees. The trees were all of the same age, and as nearly alike when planted as possible. There was, of course, considerable difference in the rate of growth in different varieties, and this was modified according to whether they were on the Paradise or Crab stocks, but comparing the same variety on the same stock pruned in the season of planting with those not pruned in the season of planting differences in subsequent behaviour were found according to whether they were on Paradise or Crab stock. The following figures are typical of the trees on Paradise stock :—

	Total growth in					
	1912.		1913.		1914.	
	ft.	in.	ft.	in.	ft.	in.
'Peasgood's Nonesuch' (average of five trees pruned in season of planting, winter 1911-12)	14	2½	30	8	66	9
Average of five trees not pruned in season of planting, winter 1911-12	8	10½	28	9	56	7

The following are typical of those on Crab stock :—

'Peasgood's Nonesuch' (average of five trees pruned in season of planting, winter 1911-12)	15	7	43	1½	99	1
Average of five trees not pruned in season of planting, winter 1911-12	13	10	39	9	110	0

Comparing these, it is seen that with both stocks greater growth was produced by the pruned trees in the first year, and this was true of all the ten sets in the experiment.

In the second year the same is true for 'Peasgood's Nonesuch' and for all the other varieties on Paradise stock, but three of the five varieties on Crab stock gave greater growth in the trees not pruned in the season of planting.

In 1914 all the trees on Paradise stock pruned in the season of planting again gave greater growth than did those not pruned, but four of the five varieties on Crab stock gave greater growth in the trees not pruned in the season of planting.

The fifth, which behaved like those on Paradise stock (as it did in 1913), was 'Mr. Gladstone,' and this, from its different habit of growth, might be expected to behave abnormally. These results uphold the advocates of pruning in the season of planting so far as dealing with trees on Paradise stock is concerned, but they also suggest that trees on Crab stock in which the pruning in the season of planting was neglected may tend to recover in time, and they help to explain the differences of results so frequently reported.

Calanthe \times *Branchii*.—Mr. Gurney Wilson, F.L.S., drew attention to the plant shown at the last meeting in order to show that crosses had previously been made between the evergreen and deciduous species of *Calanthe*, referring to the account of the exhibitions given in the *Gardeners' Chronicle* vol. xx. (1896), p. 602, when Messrs. Sander, on November 10, showed *Calanthe* \times *albata* (*C. veratrifolia* \times *C. Cooksonii* \times *Sedenii*), "a curious break between the evergreen and the deciduous *Calanthes* with white flowers, intermediate in form between the parents," mentioned in the *JOURNAL R.H.S.*, vol. 20. p. ccxv; and to *Gard. Chron.* vol. xxxiv. (1903), p. 310, when, on October 27, Mr. H. J. Elwes showed a spike of a *Calanthe*, subsequently called *C. Elwesii*. This was a cross between *C. veratrifolia* and *C. Stevensii*, "a singular hybrid between the evergreen and the deciduous sections, and with white flowers apparently intermediate. The plant was said to resemble *C. veratrifolia* in habit."

SCIENTIFIC COMMITTEE, DECEMBER 15, 1914.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, with nine members present, and Miss C. PELLEW, and Mr. J. COUTTS, visitors.

Pelargonium hybrids.—Mr. J. Fraser, F.L.S., showed dried specimens to illustrate the variation in certain forms, such as *Pelargonium* \times *Moreanum*, and made remarks on the origin of certain hybrids.

Primula floribunda, &c.—Prof. W. Bateson, F.R.S., exhibited a range of forms raised between a plant of Veitch's form of *Primula*

× *kewensis* (stated to be a piece of the original plant) and *P. floribunda*. The ovules of the *P. × kewensis* plant used appear to be infertile, but the pollen is fertile with *P. floribunda* (apparently not with *P. × kewensis* and *P. verticillata*). The plants shown exhibited white, sulphur, lemon and other shades of yellow, and one had deeper yellow flowers than × *kewensis*. Variety was also seen in the size of leaf and in degree of hairiness. The plant of *kewensis* used is the only one that has given breaks of this nature. It belongs to the small-flowered type, which has the normal number of chromosomes; not to the large-flowered type with double the normal number of chromosomes.

Seeds of Forest Trees.—Mr. H. J. Elwes, F.R.S., showed ripe seeds of *Aesculus indica* sent to him by Lord Ducie, and ripened at Tortworth, together with seeds of *Juglans nigra* and of Butter-nut ripened at the same place. He remarked upon the great length of radicle produced by the seedlings of *Juglans nigra*, which he had raised, as compared with the mass of fibrous roots produced near the surface by the Butter-nut, although the trees apparently grew under the same conditions in nature. He thought it very desirable that comparison should be made with the behaviour of seedlings raised in other places, and from seeds of American origin.

Hedychium Greenii producing apical bulb.—He also showed a stem of the Scitamineous plant, *Hedychium Greenii*, which he had collected in Bhutan, and which had flowered with him at Colesborne. He had removed the flower shoot and the plant had produced a bulb at the apex of the stem left.

Mr. Elwes also showed flowers of *Alstroemeria Hookeri* and *Tricyrtis stolonifera*.

Frost damage to Apple.—Mr. F. J. Chittenden showed an apple with ten longitudinal grooves of about a quarter inch depth on the outside, the grooves being lined with russet. He called attention to the small fruits damaged internally by frost, which he exhibited earlier in the year, and pointed out that the grooves corresponded with the position of the primary vascular bundles which had been injured by frost. These bundles in the specimen exhibited still showed signs of the damage, and the failure to grow normally was no doubt due to the interference in the sap flow brought about by this injury.

Apple in bird's-nest.—Mr. Wilson Fox, of Carmino, Falmouth, sent a photograph showing an apple attached to the tree and resting in a bird's-nest, apparently that of a redpoll.

FRUIT AND VEGETABLE COMMITTEE.

SEPTEMBER 8, 1914.

Mr. A. H. PEARSON, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Jas. Veitch, Chelsea, for fruit trees in pots.

Award of Merit.

To Blackberry 'Himalayan Giant' (votes, unanimous), from Messrs. Laxton Bros., Bedford. Grown at Wisley. The plant is a vigorous grower, producing very large trusses of fruit. The crop is heavy and extends over a long period—at least two months. The fruit is very large, quite black, of excellent flavour, but rather more acid than our native blackberry.

The awards recommended by the sub-committees at Wisley on July 30 and August 10 were confirmed. The following additional awards to Melons grown at Wisley were made:—*Highly Commended*—No. 72 'Longford Castle'; *Commended*—No. 40 'Invicta,' No. 42 'Sutton's King George,' No. 43 'Veitch's King George.' All to date from August 25, 1914. For descriptions see Reports of Wisley Trials.

Other Exhibits.

Mr. A. Basile, Woburn Park, Weybridge : seedling Apples.

Mr. G. E. Dykes, Milborne Port : seedling Apples.

Mr. I. E. Green, Saffron Walden : seedling Apples.

Mr. J. M. Phillips, Cardiff : Crab Apples.

R.H.S. Gardens, Wisley : Apples and Pears.

Mr. H. Rowleston, Gravesend : seedling Apples.

Mr. Skelton, Woking : Apples and Pears.

Lady Thorneycroft, Bembridge : seedling Apples.

Rev. A. R. Upcher, Eye : Apple 'Kerry Pippin.'

Messrs. R. Veitch, Exeter : Peach 'Golden West' and Apple 'Devonshire Queen.'

Wycombe Union School, Princes Risborough : seedling Apples.

FRUIT AND VEGETABLE COMMITTEE, CENTRAL HALLS, WESTMINSTER,
SEPTEMBER 22, 1914.

Mr. A. H. PEARSON, V.M.H., in the Chair, and fifteen members present.

Awards Recommended :—

Gold Medal.

To Mr. J. Allgrove, Langley, for fruit.

Silver-gilt Banksian Medal.

To Messrs. Dickson & Robinson, Manchester, for Onions.

To Hon. V. Gibbs, Aldenham, Elstree (gr. Mr. E. Beckett, V.M.H.), for a collection of herbs.

Silver Banksian Medal.

To David Vigo, Esq., Ducketts, Thaxted, Essex, for fruit.

To the Guildford Fruit Farm, Guildford, for Apples in boxes.

Bronze Knightian Medal.

To The Church Army, 55 Bryanston Street, Marble Arch, W., for vegetables.

Other Exhibits.

Mr. G. E. Dyke, Milborne Port : seedling Apples.

Mr. J. Friend, Little Hadham : seedling Apple.

Mr. B. Gates, Cranbrook : Pears.

Mr. W. Gee, Ventnor : seedling Apple.

Mr. W. Pope, Newbury : seedling Apples.

Miss M. Rhodes : seedling Apples.

Rev. H. S. Sculthorpe, Weston-super-Mare : Apple 'Beeley Pippin.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 6, 1914.

Mr. JOS. CHEAL in the Chair, and ten members present.

Awards Recommended :—*Silver-gilt Knightian Medal.*

To Mr. A. Basile, Woburn Park, Weybridge, for Pears.

To Messrs. Cannell, Eynsford, for a collection of Fruit.

To Messrs. Herbert Chapman, Rye, for hybrid Marrows.

Bronze Knightian Medal.

To the Purfleet Council School, Essex (A. Stapleton, Esq.), for Apples, Pears, and Outdoor Grapes.

Other Exhibits.

Mr. Ed. Collins, Woking : seedling Apples.

Baron von Ernsthause, Surbiton (gr. Mr. James) : Apple 'James' Seedling.'

Mr. Thos. Kitley, Bath : Apple 'Kitley's Pearmain.'

Mr. W. Palmer, Andover : seedling Apples and Pears.

Miss Rhodes, Dudsbury : seedling Apples.

Mr. A. Turner, Slough : Apple 'Arthur Turner.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 20, 1914.

Mr. JOS. CHEAL in the Chair, and fourteen members present.

Awards Recommended :—*Gold Hogg Memorial Medal.*

To Messrs. Bunyard, Maidstone, for Apples, Pears, and Quinces.

Gold Medal.

To Messrs. Cannell, Eynsford, for a collection of fruit.

To Messrs. Cheal, Crawley, for a collection of fruit.

To Mr. Notcutt, Woodbridge, for a collection of fruit.

Silver Knightian Medal.

To Chas. Bayer, Esq., Forest Hill, for a collection of Grapes.

To Messrs. Laxton Bros., Bedford, for a collection of fruit.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for a collection of Capsicums.

Award of Merit.

To Apple 'Harry Pring' (votes, unanimous), from Mr. Peters, Givons Grove, Leatherhead. Fruit medium size, even in contour, deep round; skin pale yellow, flushed on the sunny side with bronzy red and dotted with bright red spots; eye shallow, in a small puckered basin; segments closed and reflexed; stalk about $\frac{3}{4}$ inch long, thin, occasionally with a fleshy curl, set in a small cavity; cells large; flesh white, crisp, very juicy, pleasantly acid. Cooking excellently, pleasant for dessert. Season, October to February. The tree is a healthy grower and a free bearer. (Fig. 109.)

Other Exhibits.

Mr. J. T. Good, Watford: Apple 'Bushey Grove.'

Mr. M. Nicholls, Kemsing: seedling Apples and Pears.

Mr. W. Palmer, Andover: seedling Pears.

Mr. W. Pope, Newbury: seedling Pear 'Margarita.'

Mr. A. Wright, North Walsham: Apple 'The Ally.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 3, 1914.

Mr. A. H. PEARSON, V.M.H., in the Chair, and twelve members present.

Awards Recommended:—

Silver Knightian Medal.

Messrs. Seabrook, Chelmsford, for Apples and Pears.

Silver Banksian Medal.

Sir Montague Turner, Romford, for a collection of fruit.

Cultural Commendation.

R.H.S. Gardens, Wisley, for a collection of Quinces.

Other Exhibits.

Mrs. Watt Black, Edenbridge: outdoor Grape 'Reine Olga.'

Hon. Vicary Gibbs, Elstree (gr. Mr. E. Beckett, V.M.H.): 'Cydonia 1362' (China). A species with rich salmon flowers, a deep green fruit resembling a quince in shape.

Mr. Levy, Sittingbourne: Pear 'Josephine.'

Mr. Sutterby, Wisbech: Apple 'Sutterby's Seedling.'



FIG. 110.—APPLE "HARRY PRING" (Good Chon) (up cinnam.)

Harold P. CANN



FIG. 111.—*CAMPANULA* 'NORMAN GROVE.' (*Groce*) (p. cxci.)

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 17, 1914.

Mr. JOS. CHEAL in the Chair, and fourteen members present.

Awards Recommended :—*Silver-gilt Knightian Medal.*

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), for Leeks.

To Messrs. Sutton, for Vegetables grown since the outbreak of the War.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for Kales, Savoys, &c.

Cultural Commendation:

To Rt. Hon. Lord Hillingdon, Hillingdon Court (gr. Mr. A. R. Allen), for Pears.

Other Exhibits.

R.H.S. Gardens, Wisley : a collection of " War " Vegetables.

Messrs. Veitch, Exeter : Apple ' Cornish Gilliflower. '

Mr. Piper, Uckfield : seedling Apple.

Lady Thornycroft, Cambridge : seedling Apples.

Messrs. Hartland, Cork : Apple ' Crimson Bramley. '

Mr. Gardiner, Horsham : seedling Apple.

G. W. Tyser, Esq., Mortimer (gr. Mr. Sherlock) : Apples.

Mr. Geo. Dyke, Milborne Port : Apple ' Stowell. '

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 1, 1914.

Mr. A. H. PEARSON, V.M.H., in the Chair, and eight members present.

In consequence of the abandonment of the British Fruit Show in September, the Council specially invited exhibits of late-keeping varieties of fruits for this meeting.

Awards Recommended :—*Gold Medal.*

To J. A. Nix, Esq., Crawley (gr. Mr. E. Neal), for late-keeping Apples and Pears.

To Messrs. Bunyard, Maidstone, for late-keeping Apples and Pears.

Small Silver Cup.

To Earl of Harrington, Elvaston (gr. Mr. Goodacre), for late-keeping Apples and Pears.

To Messrs. Cannell, Eynsford, for late-keeping Apples and Pears.

Silver-gilt Knightian Medal.

To Hon. Vicary Gibbs, Aldenham (gr. Mr. Beckett, V.M.H.), for late-keeping Apples and Pears.

To F. G. B. Wingfield-Digby, Esq., Sherborne (gr. Mr. Turton), for late-keeping Apples and Pears.

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To the Barnham Nurseries, Ltd., Barnham Junction, for late-keeping Apples and Pears.

To Studley Horticultural College, Studley, for Vegetables.

To Messrs. R. Veitch, Exeter, for late-keeping Apples and Pears.

Silver-gilt Banksian Medal.

To C. L. Gordon, Esq., Castle Douglas (gr. Mr. Duff), for late Apples.

To Capt. S. G. Reid, Yalding (gr. Mr. Coleman), for late-keeping Apples and Pears.

To Messrs. Cheal, Crawley, for late-keeping Apples and Pears.

Silver Knightian Medal.

To J. T. Charlesworth, Esq., Redhill (gr. Mr. Herbert), for late-keeping Apples.

To Major Sir R. Baker, Bt., M.P., Blandford (gr. Mr. Usher), for late-keeping Apples.

To the Rt. Hon. Marquis of Ripon, Kingston (gr. Mr. Smith), for late-keeping Apples.

To Messrs. Seabrook, Chelmsford, for late-keeping Apples and Pears.

To Sir Montague Turner, Havering (gr. Mr. Humphrey), for late-keeping Apples and Pears.

To Mr. C. Turner, Slough, for late-keeping Apples.

To Messrs. Dobbie, Edinburgh, for an exhibit of potatoes resistant to *Synchytrium endobioticum*, the fungus giving rise to the disease known as potato tumour. The varieties exhibited were 'Snowdrop,' 'The Provost,' 'Peacemaker,' 'White City,' 'Burnhouse Beauty,' 'The Crofter,' 'Abundance,' 'King George,' 'Golden Wonder,' 'Great Scot,' 'The Admiral,' 'Milecross Early,' 'Conquest,' 'Langworthy' and 'What's Wanted' (white), 'Climax,' 'Mr. Bresse,' and 'Cardinal' (red), 'The Dean' (purple).

Bronze Knightian Medal.

To H. P. Sturgis, Esq., Leatherhead (gr. Mr. Peters), for Apples and Pears.

Other Exhibits.

J. E. Brown, Esq., Bletchingley (gr. Mr. Coster) : Apples.

Horticultural College, Swanley : Apples and Preserves.

Messrs. Stevens, Sidmouth : Apple 'Woolbrook Pippin.'

Mrs. Miller, Marlow : Preserves.

Messrs. Westmacott, Strand : South African Preserves, &c.

Miss Sewell, Harcourt Terrace : Preserves.

Henry Stacey, Esq., Chesham : Apple 'Lady Roberts.'

S. Little, Esq., Romford : Pear 'Uvedale's St. Germain.'

Rt. Hon. Lord Hillingdon, Uxbridge : Pear 'Dana's Hovey.'

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 15, 1914.

Mr. A. H. PEARSON in the Chair, and sixteen members present.

Awards Recommended :—*Award of Merit.*

To Apple 'Winter Ribston' (votes, unanimous), from Messrs. Bunyard. Fruit of medium size, flat-round ; skin covered with bronze, flushed with red on the exposed side ; eye large, with broad, incurved segments, partly open, set in a wide shallow basin, slightly puckered ; stalk short, $\frac{1}{2}$ inch long, thin, in a deep russet cavity ; flesh crisp, juicy, and of very fine flavour. An excellent dessert variety, in use from December to February. The tree is stated to be of a rather spreading habit, and a moderate bearer ; of Continental origin.

Other Exhibits.

Lady Thornycroft, Bembridge : Apples 'Lord Roberts' and 'Vectis.'

Mr. W. Palmer, Andover : Apples 'Lord Kitchener' and 'Joffre-French.'

Mrs. Miller, Marlow : 'Moyleen' Confections.

Misses Sewell, Harcourt Terrace, S.W. : 'Elmhurst' Preserves.

Messrs. Westmacott, Strand : South African Jams, &c.

Mr. George Bunyard, V.M.H., who has been a member of the Fruit and Vegetable Committee for thirty-four years, during many of which he was Chairman, wrote stating that, much to his regret, he was obliged by ill-health to sever his connexion with the Committee, wishing all good-bye and thanking all the members for their support and assistance in the past. Mr. Bates, Mr. Willard, and other members of the Committee spoke of the great regret all felt on Mr. Bunyard's retirement, and expressed sorrow at the cause. They wished to testify their great esteem and regard for the courteous and able manner in which he had acted as their Chairman, and the exceedingly valuable services he had rendered to the Committee by his unique knowledge of fruit and vegetables. They further expressed the great loss they had sustained in his retirement, and all sincerely hoped that his health would improve and that he would be able to enjoy a well-earned rest.

FLORAL COMMITTEE.

SEPTEMBER 8, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and eighteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. May, Upper Edmonton, for miscellaneous foliage plants.

To Messrs. Kelway, Langport, for Gladioli.

Silver-gilt Banksian Medal.

To Mr. Jas. MacDonald, Harpenden, for Grasses.

Silver Flora Medal.

To Reginald Cory, Esq., Duffryn, Cardiff, for Dahlias.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

To Messrs. Carter Page, London Wall, for Dahlias.

To Mr. J. B. Riding, Chingford, for Dahlias.

To Mr. L. R. Russell, Richmond, for Clematis.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cutbush, Highgate, for hardy plants

To Mr. A. L. Gwillim, Sidcup, for hardy plants.

To Mrs. Amos Perry, Enfield, for hardy plants.

Bronze Flora Medal.

To Messrs. Barr, Taplow, for hardy plants.

To Mr. Reuthe, Keston, for miscellaneous plants.

To Messrs. T. S. Ware, Feltham, for Dahlias.

Award of Merit.

To *Amaryllis Belladonna speciosa purpurea* (votes, 11 for, 4 against), from Messrs. R. Veitch, Exeter. A handsome variety of the Belladonna Lily. The flowers are larger than the type, being $4\frac{1}{2}$ inches long, and the colour, Tyrian pink, is much deeper, especially near the tips of the perianth pieces; they are freely borne on stout, purplish-brown stems.

To *Aster Amellus* 'King George' (votes, 12 for, 1 against), from Mr. Amos Perry, Enfield. A good variety of medium height, with large, showy heads of soft bluish-violet flowers. Each flower is 3 inches in diameter, the florets are $\frac{1}{2}$ inch wide, and the disc is bright golden-yellow.

To *Campanula* \times 'Norman Grove' (votes, unanimous), from Messrs.

Thos. B. Grove, Sutton Coldfield. A small and very attractive *Campanula*. It has the appearance of a horizontal-flowered form of the well-known *C. × 'Profusion.'* Its habit is compact and very neat, the leaves ovate-cordate, crenate; flowers very free, pale blue. Its parentage was stated to be *C. carpatica × C. Tommasiniana* (fig. 111).

To Dahlia 'Eden' (votes, 9 for), from Messrs. J. Cheal, Crawley. A Collerette variety. The flowers are round, of fine substance, and very pure white.

To Dahlia 'Étoile Rose' (votes, 8 for), from Mr. C. Turner, Slough. A well-formed Cactus variety of moderate size. The flowers are held high on stiff stalks; the florets are but little curved, and of a bright rosy-lavender colour.

To Dahlia 'Kismet' (votes, 7 for, 3 against), from Messrs. Jas. Stredwick, St. Leonards. An exhibition Cactus variety of striking form and colour. The flower is over 6 inches in diameter; the florets are long and very curved, of a rosy-purple colour, washed with orange at their bases.

To Dahlia 'Loreley' (votes, 7 for, 2 against), from Mr. C. Turner, Slough. An excellent decorative variety. The flowers are $5\frac{1}{2}$ inches in diameter, clear deep primrose colour, and are held well on long, wiry stalks.

To Dahlia 'Marguerite Phillips' (votes, 7 for), from Messrs. Jas. Stredwick, St. Leonards. An exhibition Cactus variety. The flowers are $5\frac{1}{4}$ inches in diameter, and are white, just tinged with cream. The tips of the florets are not quilled, and are twisted in the manner of a Japanese Chrysanthemum.

To Dahlia 'Mrs. Edward Drury' (votes, 6 for, 3 against), from Messrs. Jas. Stredwick, St. Leonards. An exhibition Cactus variety with long incurved florets of a light amaranth-purple colour, washed with buff at the base. The quills are open at their end, showing a white tip.

To Dahlia 'Stella' (votes, 5 for), from Mr. C. Turner, Slough. A striking Collerette variety. The flowers are $4\frac{1}{2}$ inches in diameter; the outer florets are crimson-scarlet, blotched with yellow at the base; the inner florets forming the collar are creamy white, with greenish veins.

To Dahlia 'The Swan' (votes, 8 for), from Messrs. Jas. Stredwick, St. Leonards. A good garden Cactus variety. The flowers are $6\frac{1}{2}$ inches in diameter, pure white, with long and very pointed florets. They are held high on long, stiff stalks.

To Dahlia 'White Star' (votes, 9 for), from Messrs. J. Cheal, Crawley. This variety is of the well-known 'Crawley Star' type, but the florets are rather wider than that variety. It is a most attractive white single, with a bright orange-yellow disc.

To Dahlia 'Worth Star' (votes, 5 for, 4 against), from Messrs. J. Cheal, Crawley. Like the last, this is of the 'Crawley Star' type. It is a dull, pale amaranth-purple, with narrow white stripes down the florets.

To *Gladiolus* 'Lord Alverstone' (votes, unanimous), from Messrs. Jas. Kelway, Langport. A *gandavensis* hybrid, with a large, compact spike of deeply-coloured flowers. Each flower is $3\frac{1}{2}$ inches wide; the outer perianth pieces are velvety carmine, the inner rosy purple.

To *Lilium Biondii* (votes, unanimous), from Mr. Amos Perry, Enfield. This is one of the newer Chinese species, and is closely related to *L. Leichlinii*. The flowers are pendulous and are freely borne on stiff, wiry stalks. The flower is $2\frac{1}{2}$ inches in diameter; the perianth pieces are much reflexed; each is $2\frac{1}{4}$ inches long when unrolled, $\frac{1}{2}$ to $\frac{3}{4}$ inch wide. The flower is flame-scarlet, with many small brown-black spots. The pollen is chocolate-red. The leaves are linear, 3 inches long, and crowded at the lower part of the stem. (Fig. 112.)

N.B.—The above awards to Dahlias were recommended by a Joint Committee of the R.H.S. Floral Committee and the National Dahlia Society.

Other Exhibits.

Messrs. Burrell, Cambridge : Dahlias.

Messrs. Dobbie, Edinburgh : Collarette Dahlias.

Mr. C. Engelmann, Saffron Walden : Perpetual Carnations.

Misses Hopkins, Shepperton : rock plants.

Messrs. Keynes Williams, Salisbury : Dahlias.

Mrs. Lilley, Clacton-on-Sea (gr. Mr. P. S. Hayward) : Perpetual Carnations.

Mr. G. W. Miller, Wisbech : hardy plants.

Mrs. O'Sullivan, Westminster : a London garden.

Mrs. Ramsay Harman, New Milton : Dahlias.

Messrs. Reamsbottom, Geashill : St. Brigid Anemones.

Mr. H. Shoesmith, Woking : Dahlias 'Marion' and 'Phœbus.'

Messrs. R. Veitch & Sons, Exeter : Collarette Dahlias.

Mr. W. Wells, jun., Merstham : hardy plants.

FLORAL COMMITTEE, SEPTEMBER 22, 1914.

AT CENTRAL HALL, WESTMINSTER.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt-Flora Medal.

To Mr. J. B. Riding, Chingford, for Dahlias.

Silver-gilt Banksian Medal.

To Messrs. Carter Page, London Wall, for Dahlias.

To Mr. L. R. Russell, Richmond, for stove plants.

Silver Flora Medal.

- To Mr. E. Ballard, Colwall, for Asters.
- To Messrs. B. R. Cant, Colchester, for Roses.
- To Messrs. Cheal, Crawley, for Dahlias.

Silver Banksian Medal.

- To Messrs. Brown, Peterborough, for Roses.
- To Messrs. Carter, Raynes Park, for Dahlias.
- To Messrs. Jones, Lewisham, for Asters.
- To Messrs. May, Edmonton, for greenhouse plants.
- To Mr. Amos Perry, Enfield, for hardy flowers.
- To Messrs. Wells, Merstham, for Phloxes.
- To Mr. Engelmann, Saffron Walden, for Carnations.
- To Messrs. Ware, Feltham, for Dahlias.
- To Mr. West, Brentwood, for Dahlias.

Bronze Banksian Medal.

- To Mr. G. Reuthe, Keston, for miscellaneous plants.

Award of Merit.

To *Heliotrope* 'Mrs. J. W. Lowther' (votes, 12 for), from Messrs. Cutbush, Highgate. The flowers are large, borne in heads from 6 to 9 inches in diameter, very deeply coloured and heavily scented.

To *Aster Amellus* 'Arethusa' (votes, unanimous), from Messrs. Ware, Feltham. The plants are of moderate height—24–27 inches, with large trusses of flowers. Each flower is about 3 inches in diameter; ray florets rose pink, disc golden-yellow. This is a very beautiful variety, certainly the most pink of any of the *Amellus* section.

To *Aster vimineus* 'Lovely' (votes, unanimous), from Messrs. H. J. Jones, Lewisham. The small rosy-lilac flowers are very freely borne in large horizontal trusses.

To *Pileostegia viburnoides* (votes, unanimous), from Hon. Vicary Gibbs, Aldenham House, Elstree (gr. Mr. E. Beckett, V.M.H.). A new shrub from China. The seed was collected by Mr. E. H. Wilson and sent to the Arnold Arboretum. It is evergreen, 18 inches high, leaves decussate, elliptic, entire, leathery; flowers in terminal heads, creamy white, resembling those of a *Viburnum*. *Pileostegia* is a monotypic genus of the N.O. Saxifragaceae. (Fig. 113.)

To *Salvia Greigii* (votes, unanimous), from Mr. Amos Perry, Enfield. A shrubby plant with ovate, entire, deep green, glabrous leaves; flowers in terminal racemes, peduncle, pedicel, and calyx reddish; corolla with a broad 2-lobed lip and small, narrow hood, rosy scarlet. The plant is quite hardy.

To *Dahlia* 'Lord Kitchener' (votes, 5 for, 2 against), from Mr. Shoesmith, Woking. An exhibition Cactus variety. The flowers are 8½ inches in diameter; florets stiff, pointed, little curved, deep crimson-scarlet.

To *Dahlia* 'Neptune' (votes, unanimous), from Messrs. J. Stredwick, St. Leonards. An exhibition Cactus variety; flowers 6½ inches

in diameter; florets curved, twisted, open at the tips, deep rose-pink, streaked with carmine.

To Dahlia 'W. E. Peters' (votes, 5 for, 3 against), from Messrs. J. Stredwick, St. Leonards. An exhibition Cactus variety; flowers 6½ inches in diameter; florets very much curved, deep scarlet-crimson.

To Dahlia 'Melody' (votes, unanimous), from Messrs. J. Stredwick, St. Leonards. An exhibition cactus variety; flowers 7½ inches in diameter; florets crowded, open at the tips, light lemon-yellow.

To Dahlia 'Lowfield Star' (votes, 5 for, 2 against), from Messrs. J. Cheal, Crawley. A flower of the 'Cosmea' flowered type. Its form is that of 'Crawley Star'; the colour is rosy-lilac—very attractive in artificial light.

To Dahlia 'Barbara Purvis' (votes, 7 for), from Messrs. Keynes Williams, Salisbury. A pompon variety; the flowers are small, compact, white, held well on long, wiry stalks.

NOTE.—The above awards to Dahlias were recommended by a Joint Committee of the R.H.S. and the National Dahlia Society.

Other Exhibits.

Messrs. J. Burrell, Cambridge: Dahlias.

Misses Dixon, Edenbridge: hardy flowers.

Misses Hopkins, Shepperton: rock plants.

Messrs. S. Low, Enfield: greenhouse plants.

Messrs. Wells, Merstham: Chrysanthemums.

Mr. J. T. West, Brentwood: Dahlias.

FLORAL COMMITTEE, WISLEY, SEPTEMBER 25, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and eight members present.

Awards Recommended:—

Award of Merit.

To Chrysanthemum:—No. 65, 537. 'Abercorn Beauty' (A.M. Sept. 15, 1910); 95, 160, 497, 525. 'Carrie' (A.M. Sept. 23, 1902); 71, 181, 514. 'Crimson Polly' (A.M. Sept. 10, 1912); 24, 66, 132. 'Diana' (A.M. Sept. 29, 1910); 108, 471. 'Ethel' (A.M. Sept. 11, 1906); 56. 'F. Wilson'; 62, 344. 'George Bowness' (A.M. Sept. 12, 1905); 40, 86, 340, 559. 'Goacher's Crimson' (A.M. Sept. 10, 1901); 23, 81, 343, 482. 'Harrie' (A.M. Sept. 12, 1905); 329, 483. 'J. Bannister'; 35, 105, 313, 434. 'Leslie' (A.M. Sept. 14, 1909); 250, 472. 'Lorraine'; 527. 'Mabel Roberts'; 28, 85, 512. 'Market White' (A.M. Sept. 29, 1910); 162. 'Martin Peed'; 36, 87, 280, 551. 'Mme. Marie Masse' (A.M. Aug. 8, 1898); 75, 300, 485. 'Mrs. J. Fielding' ('Goacher's Terra-cotta'); 88, 252, 517. 'Mrs. W. Sydenham'; 100, 287, 474. 'Nina Blick' (A.M. Sept. 15, 1910); 22, 276, 433. 'Perle Chatillonnaise' (A.M. Sept. 29, 1910); 13, 84, 292, 455. 'Polly' (A.M. Sept. 29, 1910).



G.M. 1473.

FIG. 112. *LILIUM BRONDII* (Gard. Mag.) (p. cxvii.)

[To face p. cxvii.]

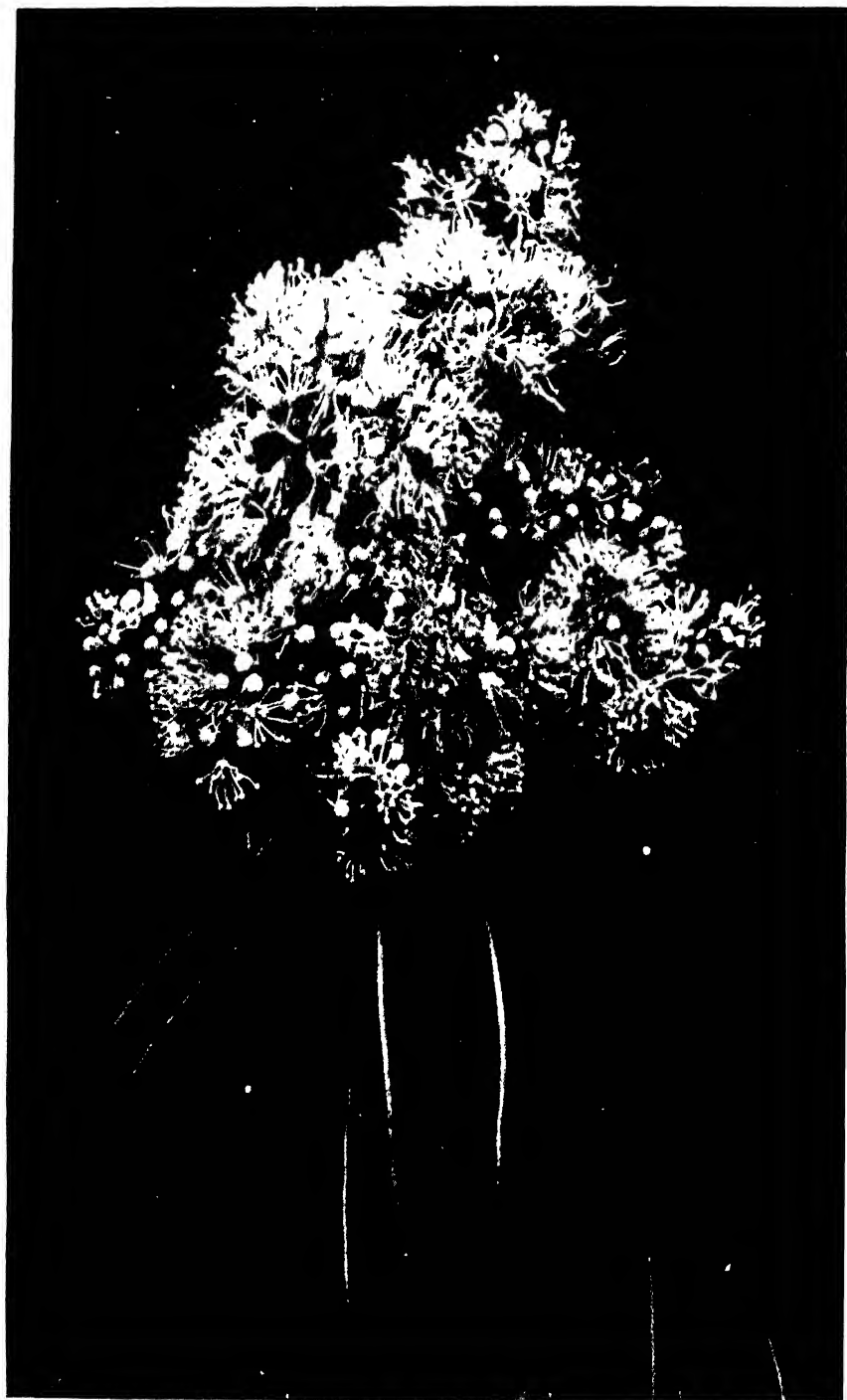


FIG. 113 --PTILOSTEGIA VIBURNOIDES. (*Gard Chion*) (p. CXIII)



FIG. 114. CARNATION 'PRINCESS DAGMAR' (*Low*) (p. cxvii)



FIG 115 ASTER 'CLOUDY BLUE' (Ballard) (p cxvii)

[To face p cxv]

36. *Helenium autumnale* 'Gartensonne'; 33. *Helenium autumnale grandiflorum*; 29. *Helenium autumnale superbum rubrum*; 31, 39. *Helenium* 'Riverton Gem'; 8. *Helianthus multiflorus plenus*; 3. *Helianthus rigidus* 'Rev. Wolley Dod'; 13. *Helianthus rigidus semiplenus* (F.C.C. Sept. 25, 1888).

Highly Commended.

To *Chrysanthemum*:—No. 163. 'Brighton'; 20, 259, 422. 'Crimson Diana'; 246. 'Gascoigne.'

For descriptions of the above see Reports of Wisley Trials, p. 511, and p. 544.

FLORAL COMMITTEE, OCTOBER 6, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. J. Cheal, Crawley, for autumn foliage.

To Messrs. H. J. Jones, Merstham, for Asters.

To Messrs. H. B. May, Edmonton, for Crotons.

Silver Banksian Medal.

To Mr. F. Ballard, Colwall, for Asters.

To Mr. Amos Perry, Enfield, for hardy flowers.

To Mr. G. Prince, Longworth, for Roses.

To Mr. L. R. Russell, Richmond, for shrubs in pots.

To Mr. W. Wells, Jr., Merstham, for hardy flowers.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Stuart Low, Enfield, N., for Carnations.

Bronze Banksian Medal.

To Messrs. Clark, Dover, for hardy flowers.

Award of Merit.

To Carnation 'Princess Dagmar' (votes, 13 for), from Messrs. Allwood, Haywards Heath, and Messrs. Stuart Low, Enfield. A perpetual-flowering Carnation bearing a general resemblance to 'Carola.' The flowers are large, heavily built, of good substance, dark crimson-maroon, and well scented. The stalk is stiff and the calyx good (fig. 114).

To Collerette Dahlia 'Canopus' (votes, 13 for), from Messrs. J. Stredwick, St. Leonards. The flower is large, 5 inches in diameter, round in outline; florets of good substance, those of the collar being very long, white, flushed with deep citron-yellow. The flower is held well on stiff stalks.

To Aster 'Purple Prince' (votes, 10 for, 4 against), from Hon. Vicary Gibbs, Aldenham House, Elstree. This is a handsome

variety, a seedling from 'W. Bowman' belonging to the *Novi-Angliae* section. The flowers are large and borne in compact panicles; ray florets light violet-purple, disc florets deep orange-yellow.

To *Aster* 'Cloudy Blue' (votes, 11 for, 4 against), from Mr. E. Ballard, Colwall, Malvern. This pretty variety belongs to the *Novi-Belgii* section. The flowers are borne in large panicles; the ray florets are in several whorls, giving the flower a double appearance when young, pale bluish-lavender; disc florets yellow (fig. 115).

Other Exhibits.

The Rev. Canon Cooper Marsden, D.D., Bickley (gr. Mr. W. Rigby): *Chrysanthemum* 'W. Rigby.'

Messrs. Barr, Covent Garden: *Nerines* and hardy flowers.

The Misses Hopkins, Shepperton-on-Thames: rock plants.

Mr. G. Reuthe, Keston: miscellaneous plants.

A. Worsley, Esq., Isleworth: *Nerines*.

FLORAL COMMITTEE, WISLEY, OCTOBER 16, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and six members present.

The following recommendations for award were made to be submitted to the next full meeting of the Committee:—

Awards Recommended:—

Award of Merit.

To *Chrysanthemum*:—Nos. 165, 501. 'Almirante'; 82, 427. 'Bronze Goacher' (**A.M.** Oct. 24, 1911); 74, 158. 'Caledonia'; 39, 138, 529. 'Champ d'Or'; 497. 'Evelyn'; 31, 93, 296, 536. 'Fée Parisienne'; 496. 'Jimmie'; 58, 538. 'Pluie d'Argent'; 52, 308. 'R. Pemberton'; 19, 106, 309, 444. 'Roi des Blancs'; 102. 'Stella'; 127, 432. 'Tonkin.'

Highly Commended.

To *Chrysanthemum*:—Nos. 504. 'A. Barnham'; 111, 337. 'Ernest Baltet'; 114. 'Fleuve Rouge' (224. 'Flambeau'); 199. 'May'; 9, 272, 428. 'Minnie Carpenter'; 120, 241. 'Miss B. Miller' 469. 'Mme. Drouard'; 406. 'Nellie Riding.'

FLORAL COMMITTEE, OCTOBER 20, 1914.

Mr. H. B. MAY, V.M.H., in the Chair and twenty-seven members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. J. Veitch, Chelsea, for *Begonias*.

Silver-gilt Banksian Medal.

To Messrs. Jones, Lewisham for *Asters*.

Silver Flora Medal.

- To Messrs. B. R. Cant, Colchester, for Roses.
- To Messrs. Dobbie, Edinburgh, for Dahlias.
- To Messrs. May, Edmonton, for greenhouse plants.
- To Mr. A. Perry, Enfield, for Scolopendriums.
- To Mr. L. R. Russell, Richmond, for Shrubs.

Silver Banksian Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Mr. Engelmann, Saffron Walden, for Carnations.
- To Messrs. Low, Bush Hill Park, for Carnations.
- To Mr. G. Reuthe, Keston, for miscellaneous plants.
- To Messrs. Treseder, Cardiff, for Dahlias.
- To Messrs. Wells, Merstham, for Chrysanthemums.

Award of Merit.

To Begonia 'Mrs. Harry Barton' (votes, 10 for, 4 against), from Miss Tanner (gr. Mr. W. Streeter), Caldecote Towers, Herts. A well-grown plant of this variety was exhibited; it bore double flowers, $2\frac{1}{2}$ inches in diameter, in large numbers. When first open the flowers are yellowish, then become more or less suffused with pink at the base of the petals, and finally become quite white. These white flowers form a pleasing contrast with the dark green, glossy foliage. The variety is stated to be a sport from 'Emily Clibran.'

To Carnation 'Wivelsfield White' (votes, unanimous), from Messrs. Allwood, Haywards Heath. A perpetual-flowering variety of great merit. The flowers are pure white, large, well shaped, of good substance, with a good calyx and heavily scented; they are borne on long, stout stems.

To Chrysanthemum 'James Stredwick' (votes, 17 for), from Messrs. Stredwick, St. Leonards. An exhibition Japanese variety resembling in form 'Mildred Ware.' The florets are long and drooping, of good substance and moderate width; dull, pale rose-red on a dull buff reverse.

To Chrysanthemum 'W. Rigby' (votes, 22 for), from the Rev. Canon Cooper Marsden, D.D., Bickley (gr. Mr. W. Rigby). A sport from 'Mrs. Gilbert Drabble.' It possesses the fine form and shape of that variety, but is of a clear lemon-yellow colour.

To Dahlia 'Deveron' (votes, 15 for), from Messrs. Dobbie, Edinburgh. A collerette variety. The ray florets are rhodamine purple, of good form and substance; the collar florets are white, more or less streaked with purple. The flowers are borne on long, stiff stalks.

Other Exhibits.

- Messrs. Barr, Covent Garden: miscellaneous plants.
- Mr. Box, Lindfield: Asters, &c.
- Messrs. Cutbush, Highgate: greenhouse plants.
- Mr. C. Elliott, Stevenage: alpine plants in plots.

CXCVIII PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Misses Hopkins, Shepperton : rock plants.

Mr. Kettle, Corfe Mullen : Violets.

Misses Price & Fyfe, E. Grinstead : Carnations and Chrysanthemums.

Mr. W. Wells, Jr., Merstham : Phlox and Asters.

FLORAL COMMITTEE, NOVEMBER 3, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Gold Medal.

To E. Mocatta, Esq., Woburn Place, Addlestone (gr. Mr. T. Stevenson), for Chrysanthemums.

Silver-gilt Flora Medal.

To Mr. Norman Davis, Framfield, for Chrysanthemums.

To Messrs. H. J. Jones, Lewisham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. S. Low, Bush Hill Park, for Carnations and Begonias.

To Messrs. Peed, Norwood, for Chrysanthemums.

Silver Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Dahlias.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. May, Edmonton, for greenhouse plants.

To Mr. Amos Perry, Enfield, for hardy Ferns.

To Messrs. Rasmussen & Crone, Wanstead, for Begonias.

To Mr. L. R. Russell, Richmond, for shrubs.

To Messrs. W. Wells, Merstham, for Chrysanthemums &c.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cutbush, Highgate, for Carnations.

To Mr. G. Reuthe, Keston, for miscellaneous plants.

Bronze Banksian Medal.

To Messrs. Barr, Covent Garden, for miscellaneous plants.

To Mr. Kettle, Corfe Mullen, for Violets.

Award of Merit.

To *Polystichum angulare divisilobatum plumosum densum superbum* (votes, unanimous), from Mr. A. Perry, Enfield. A very handsome hardy fern resembling a *Todæa*. The pinnæ are much more deeply cut and more densely tufted than in *P. a. densilobatum*. The colour is golden-green (fig. 116).

To *Lapageria alba delicata* (votes, unanimous), from Elizabeth Lady Lawrence, Burford, Dorking (gr. Mr. Bain). This variety was raised from seed of *L. alba*. The flowers are of somewhat better

substance than the female parent, and are white, with a delicate rose-pink flush. It is a most pleasing variety.

To Chrysanthemum 'Captain Fox' (votes, 16 for), from Messrs. W. Wells, Merstham. A fine exhibition Japanese variety. The flower is large, almost spherical, compact; the centre is good; the florets are crimson, with pale, dull yellow reverse.

To Chrysanthemum 'Mrs. J. Gibson' (votes, 19 for), from Messrs. Wells, Merstham. A large, exhibition Japanese variety; the centre is good; the florets are broad, long, and of good substance, white, shaded with mallow purple. The colour is deeper on the outer florets than on the inner.

To Chrysanthemum 'La Nègresse' (votes, 12 for), from Messrs. Wells, Merstham. A decorative Japanese variety. The flowers were of moderate size, 4 inches in diameter, crimson, the bronze reverse of the florets showing in the centre of the flower.

Other Exhibits.

Messrs. Cannell, Eynsford : Pelargoniums.

Messrs. Cheal, Crawley : autumn foliage.

Mr. C. Elliott, Stevenage : alpines.

The Earl of Gainsborough, Oakham : new Chrysanthemums.

Hon. Vicary Gibbs, Aldenham : shrubs and a new Aster.

Mr. F. Green, Greenford : Chrysanthemums.

Misses Hopkins, Shepperton-on-Thames : rock plants.

Messrs. James, Farnham Royal : Chrysanthemums.

Mr. Lingwood, Englefield Green : a new Chrysanthemum.

Mr. H. Poulton, Ware : seedling Chrysanthemum.

Misses Price & Fyfe, E. Grinstead : Carnations and Chrysanthemums.

Leopold Salomons, Esq., Dorking : new Chrysanthemum.

Messrs. Waterer Sons & Crisp, Liverpool Street : miscellaneous plants.

Mr. Wells, Jr., Merstham : alpines.

FLORAL COMMITTEE, NOVEMBER 17, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Gold Medal.

To Messrs. Jones, Lewisham, for Chrysanthemums.

Silver-gilt Banksian Medal.

To Messrs. Hill, Edmonton, for Ferns.

To Messrs. Peed, Norwood, for Chrysanthemums.

Silver Flora Medal.

To Messrs. Stuart Low, Bush Hill Park, for Begonias and Carnations.

Silver Banksian Medal.

- To Mr. Engelmann, Saffron Walden, for Carnations.
- To Messrs. May, Edmonton, for Cyclamen.
- To Mr. Russell, Richmond, for berried shrubs.
- To Messrs. Wells, Merstham, for Chrysanthemums.

Bronze Flora Medal.

- To Messrs. Allwood, Haywards Heath, for Carnations.
- To Misses Price & Fyfe, E. Grinstead, for Carnations and Chrysanthemums.
- To Messrs. Godfrey, Exmouth, for Chrysanthemums.
- To G. W. Tyser, Esq., Mortimer (gr. Mr. Sherlock), for Chrysanthemums.

Bronze Banksian Medal.

- To Messrs. Cutbush, Highgate, for Carnations.
- To Mr. Kettle, Corfe Mullen, for Violets.
- To Mr. Perry, Enfield, for hardy Ferns.
- To Mr. Reuthe, Keston, for miscellaneous plants.
- To Messrs. Wills & Segar, Kensington, for Ericas.
- To Earl Brownlow (gr. Mr. Robertson), for Begonias.
- To Miss Baird, W. Malvern (gr. Mr. Irvine), for Chrysanthemums.

Award of Merit.

To Carnation 'Pink Sensation' (votes, 14 for), from Messrs. Wells, Merstham. A perpetual-flowering variety, very free-flowering; stems of moderate length, stiff; calyx fair; flower 4 inches in diameter, well filled with florets of good substance, fimbriate, deep pink, with minute spots of rose-red.

To Chrysanthemum 'Meudon' (votes, 12 for, 3 against), from Messrs. Wells, Merstham. An exhibition Japanese variety. The flower is held well on stiff stems, almost globular, 9 inches in diameter; florets of good substance, broad, rather short, mallow purple above, creamy below.

To Chrysanthemum 'Sir Tony' (votes, 8 for, 4 against), from Messrs. James, Farnham Royal. A single decorative variety. The flowers are 3 inches with a disc $\frac{1}{4}$ inch in diameter. The single whorl of ray florets is much recurved, rufous-red in colour; in strong light it is almost scarlet.

Other Exhibits.

Messrs. Barr, Covent Garden: hardy plants.

Mr. Blick, Hayes: Carnation 'Princess Marie José.'

Mr. Clarke, Elstree: Chrysanthemum 'Dainty.'

Mr. C. Elliott, Stevenage: alpine plants.

'The Garden,' Tavistock Street: drawings, coloured plates, &c.

Mr. Green, Greenford: Seedling Chrysanthemums.

Miss Gundry, Foots Cray: paintings.

Mr. Hill, Brighton: Chrysanthemum 'Fairy Queen.'

Misses Hopkins, Shepperton : rock plants.

Mr. L. Lawrence, Shoreham : Chrysanthemum ' L. Lawrence.'

Mr. Powell, Ryde : Chrysanthemum ' La Minette.'

Miss Warrington, Streatham : paintings.

FLORAL COMMITTEE, DECEMBER 1, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Gold Medal.

To Misses Tanner & Tait, Bushey, for Winter-flowering Begonias.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

Silver-gilt Banksian Medal.

To Major Sir Randolph Baker, Bt., Blandford, for Carnations.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations and greenhouse plants.

To Messrs. May, Edmonton, for Ferns and greenhouse plants.

Silver Banksian Medal.

To Mr. L. R. Russell, Richmond, for shrubs.

To Messrs. Wells, Merstham, for Chrysanthemums.

To Messrs. Wills & Segar, Kensington, for greenhouse plants.

To Mr. Dutton, Iver, for Carnations.

Award of Merit.

To Chrysanthemum ' Mollie Godfrey ' (votes, unanimous), from E. Mocatta, Esq. (gr. Mr. Stevenson), Woburn Place, Addlestone. A distinct, bright-coloured single variety. The flower is produced on a long, stiff stalk, and is 4 inches in diameter ; the ray florets are straight, with a slightly reflexed tip, broad and of good substance ; bright rhodamine purple, with a white ring round the bold, bright yellow disc.

Other Exhibits.

Messrs. Cutbush, Highgate : greenhouse plants.

Mr. Elliott, Stevenage : alpine plants.

Misses Hopkins, Shepperton : rock gardens.

Messrs. Piper, Bayswater : miscellaneous plants.

Misses Price & Fyfe : Carnations and Chrysanthemums.

Mr. Reuthe, Keston : miscellaneous plants.

Messrs. Ware, Feltham : alpine plants.

Messrs. Peed, Norwood : Chrysanthemums.

Mr. Ellis, Weston-super-Mare : Chrysanthemum ' King Albert.'

C. W. Dyson-Perins, Esq. (gr. Mr. Bayford), Malvern: *Primula* × *keuensis davenhamensis* fl. pl.

Hon. Vicary Gibbs (gr. Mr. Beckett, V.M.H.), Aldenham: *Pyra-cantha crenulata*.

J. Dewrance, Esq., Chislehurst: Chrysanthemum 'Mrs. Evelyn Rich.'

Messrs. R. Veitch, Exeter: Carnation 'Mme. Chas. Page.'

Mrs. Fisher, E. Molesey: water-colour paintings of gardens.

Miss Stock, Charlwood St., S.W.: garden paintings.

FLORAL COMMITTEE, DECEMBER 15, 1914.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. May, Edmonton, for Poinsettias.

To Messrs. Piper, Bayswater, for Azaleas.

To Messrs. Wills & Segar, Kensington, for greenhouse plants.

To Mr. Russell, Richmond, for shrubs and Begonias.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for greenhouse plants.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Stuart Low, Bush Hill Park, for Carnations and greenhouse plants.

To Messrs. Malby, Woodford, for garden photographs.

Bronze Flora Medal.

To Messrs. Wells & Co., Merstham, for Carnations and Chrysanthemums.

Award of Merit.

Euphorbia (Poinsettia) pulcherrima rosea (votes 12 for, 3 against), from Messrs. May, Edmonton. A variety of the well-known *E. pulcherrima*, differing from the type by the fact that the bracts are rose-pink instead of crimson. The lower ones have greenish veins.

Chrysanthemum 'Richmond' (votes 12 for, 3 against), from E. Mocatta, Esq., Woburn Place, Addlestone (gr. Mr. T. Stevenson). A decorative variety, flowers of moderate size, and almost spherical; florets broad, pointed, incurved, bright lemon-yellow. The neck is good, and the plants are 3 feet in height. The variety is of American origin.

Celastrus articulatus (votes, unanimous) from the Royal Botanic Gardens, Kew. A climbing shrub of great beauty when in fruit. The stems are brown, and each of the young buds has two short

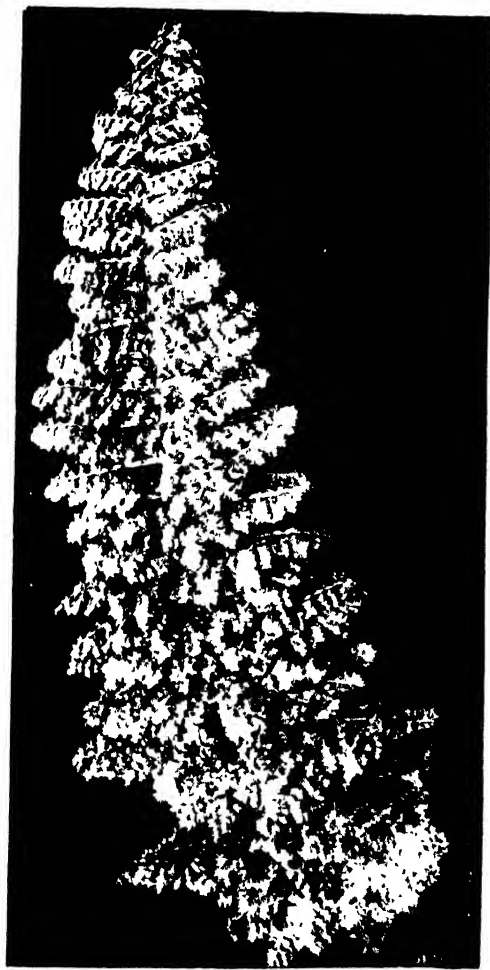


FIG. 116.—POLYSTICHUM ANGULARE V. M. (*Gara Chun*) (p. CXXIII.)

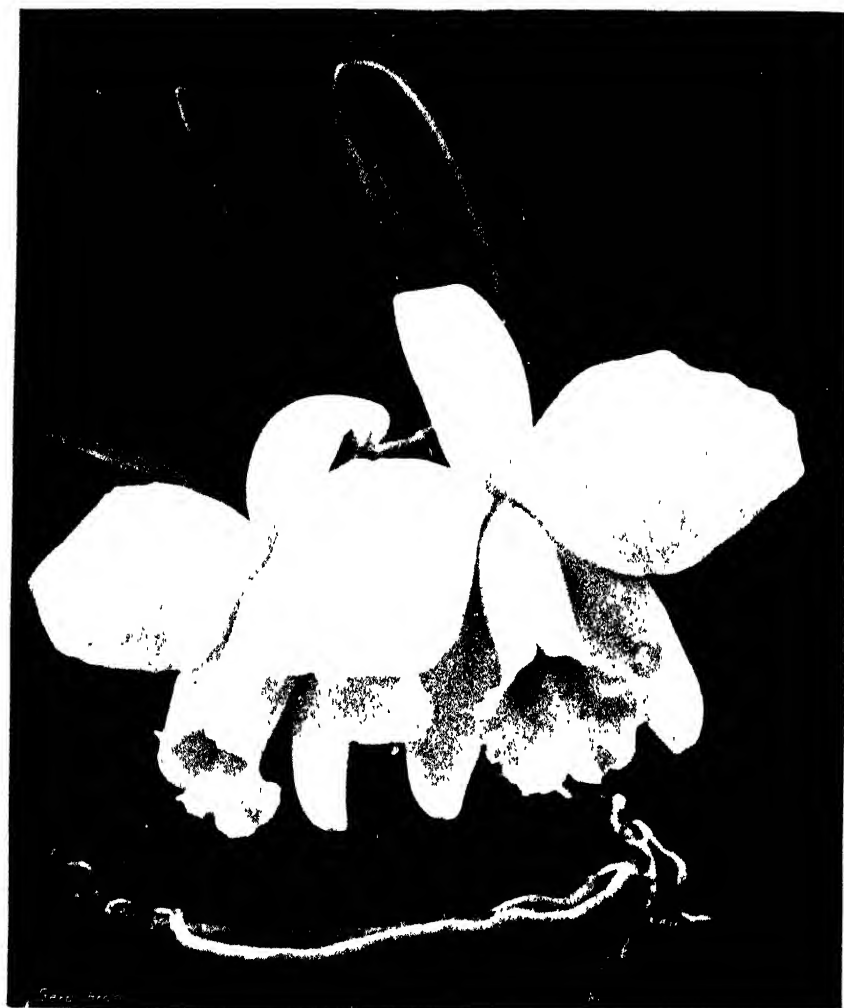


FIG. 117 - *LELIA PUMILA ALBA*, ORCHID DENT. VAR. (*Gard Chron.*) (p. cavi.

To face p. com.

deciduous spines at its base. The fruit is produced in great abundance, at first green, then yellow, and when fully ripe the capsule splits, disclosing the golden inner surface of the three reflexed valves and the brilliant scarlet aril around the seeds. The plant is a native of Japan.

Cultural Commendation.

To *Luculia gratissima* (votes, unanimous), from H. J. Elwes, Esq., F.R.S. (gr. Mr. Walters), Colesborne Park, near Cheltenham. The panicles of rose-pink flowers were of remarkable size.

Other Exhibits.

Mr. C. Elliott, Stevenage : alpines.

Misses Hopkins, Shepperton : small rock-gardens.

Mr. G. Reuthe, Keston : miscellaneous plants.

Mrs. Fisher, Molesey : paintings.

Miss Stock, Charlwood Street : paintings.

Miss Randolph, Putney : paintings.

Miss Cox, London, W. : paintings.

ORCHID COMMITTEE.

SEPTEMBER 8, 1914.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended :—

Silver Banksian Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for a group.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Sander, St. Albans, for rare species and hybrids.

To Messrs. Stuart Low, Jarvisbrook, for a group.

First-class Certificate.

To *Cattleya* × 'Sybil' var. 'Lord Kitchener' (*Dowiana aurea* × *iridescens*) (votes, unanimous), from Messrs. Hassall, Southgate. A fine flower with broad sepals and petals of a deep chrome-yellow. Lip orange at the base ; the broad front lobe ruby-crimson.

Award of Merit.

To *Cattleya* × *iridescens aurifera* (*bicolor* × 'Eldorado') (votes, unanimous), from Messrs. E. H. Davidson, Twyford. In form nearest to *C. bicolor*. Sepals and petals golden yellow ; the front of the lip rose-purple, the isthmus between the short side and middle lobes orange.

To *Laeliocattleya* × 'Thyone,' McBean's variety (*L.-c.* × 'Ophir' × *C. Dowiana aurea*) (votes, unanimous), from Messrs. McBean, Cooksbridge. A well-formed flower, with yellow sepals and petals and broad purplish-crimson lip, with yellow lines at the base.

Other Exhibits.

R. G. Thwaites, Esq. : *Odontiodas*.

Messrs. Hassall : hybrid *Cattleyas*.

Messrs. Flory & Black : *Cirrhopetalum Rothschildianum*.

Messrs. E. H. Davidson : hybrids.

R. Brooman White, Esq. : *Odontoglossum* × *Aliciae*.

Messrs. McBean : hybrids.

ORCHID COMMITTEE, CENTRAL HALL, WESTMINSTER, SEPTEMBER 22, 1914.

Mr. J. GURNEY FOWLER in the Chair, and sixteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for rare orchids.

To Messrs. Sander, St. Albans, for hybrids and orchids of botanical interest.

To H. T. Pitt, Esq., Stamford Hill (gr. Mr. Thurgood), for a group.
To Messrs. Stuart Low, Jarvisbrook, for a group.

Bronze Banksian Medal.

To R. G. Thwaites, Esq., Chessington, Streatham, for *Odontiodas*, and other orchids.

Award of Merit.

To *Cattleya* × *amabilis*, Fowler's variety (*labiata* × *Warscewiczii*) (votes, unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury, Tunbridge Wells (gr. Mr. J. Davis). An improvement on *C. labiata*, but of a similar purplish-rose colour with the addition of light yellow blotches on sides of lip, acquired from *C. Warscewiczii*.

Other Exhibits.

Pantia Ralli, Esq. : three *Laeliocattleyas*.

J. Gurney Fowler, Esq. : *Cattleya* × 'Prince Edward.'

Messrs. Hassall : forms of *Cattleya* × 'Sybil.'

Messrs. McBean : *Odontiodas*, &c.

ORCHID COMMITTEE, OCTOBER 6, 1914.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended :—

Bronze Banksian Medal.

To T. J. Finnie, Esq., Claygate, for forms of *Cattleya labiata*.

First-class Certificate.

To *Laeliocattleya* × 'Mrs. Evelyn Norrie' (parentage unrecorded) (votes, unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). A fine hybrid of *L.-c.* × *luminosa* class. Sepals and petals clear light yellow; lip violet-purple, with whitish lines at the base.

To *Cattleya* × 'Oberon' var. 'Princess Royal' ('*Fabia*' × *Hardyana*) (votes, unanimous), from J. Gurney Fowler, Esq. Flowers large, bright rosy-mauve; lip ruby-crimson, with gold lines running into the centre.

To *Cattleya* × 'Rhoda,' Fowler's variety ('*Iris*' × *Hardyana*) (votes, unanimous), from J. Gurney Fowler, Esq. Flower intermediate between the two parents in shape, and of firm texture. Sepals and petals Indian red, with a yellow shade. Lip ruby-red, with gold-coloured lines.

Award of Merit.

To *Cattleya* × 'Antiope' (*Chamberlainiana* × *Dowiana aurea*) (votes, unanimous), from J. Gurney Fowler, Esq. Formed like *C. Dowiana aurea*. Sepals and petals cowslip yellow; lip reddish purple, with yellow lines as in *C. aurea*.

To *Laeliocattleya* × 'Britannia Melanie' (*L.-c.* × *Canhamiana alba* × *C. Warscewiczii* 'Frau Melanie Beyrodt') (votes, 10 for, 4 against),

from Messrs. Charlesworth. Flowers white, with violet front to the lip.

Other Exhibits.

Elizabeth Lady Lawrence (gr. Mr. W. H. White) : a fine inflorescence of *Vanda* × 'Marguerite Maron' with twelve flowers.

J. Gurney Fowler, Esq. : new hybrids.

R. G. Thwaites, Esq. (gr. Mr. Hannington), two forms of *Sophrocattleya* × *Blackii*.

Messrs. Sander : *Miltonia* × *Bleuana* 'General Joffre.'

Messrs. Charlesworth : forms of *Oncidium bicallosum*.

Messrs. Hassall : *Cattleya* × 'Sylvia' *citrina* and *C.* × 'Venus.'

Messrs. Flory & Black : *Brassocattleya* × 'Ilene.'

Mr. Geo. Little, Groombridge : *Oberonia myriantha*.

ORCHID COMMITTEE, OCTOBER 20, 1914.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for a group.

To Messrs. Sander, St. Albans, for hybrids and rare species.

First-class Certificate.

To *Laelia pumila alba*, Orchid Dene variety (votes, unanimous), from Messrs. Davidson, Orchid Dene, Twyford. A true albino, the flowers being pure white, with a slight pale yellow disc to the lip.

Award of Merit.

To *Laeliocattleya* × 'Lady Oliphant' (*L.-c.* × 'Norba' × *C.* × 'Souvenir de Queen Victoria') (votes, 14 for, 2 against), from Pantia Ralli, Esq., Ashted Park, Surrey. In shape like *C. Dowiana aurea*. Sepals and petals pale greenish yellow. Lip deep claret-red, with gold veining.

To *Cattleya* × 'Ajax,' Orchidhurst variety (*Dowiana aurea* × *Armstrongiae*) (votes, unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. Flower freely produced; rose-pink, with ruby-crimson front to the lip, which has a yellowish base.

To *Odontonia* × 'Magali Sander' *xanthotes* (*M. Warscewiczii alba* × *O. ardentissimum xanthotes*) (votes, 15 for, 0 against), from Messrs. Charlesworth. The albino characters of the parents are in this perpetuated. Flowers white with obscure greenish markings where the rose of normal varieties appears.

Other Exhibits.

His Grace the Duke of Marlborough (gr. Mr. Hunter) : *Laeliocattleya* × *luminosa*, Blenheim var.

Col. C. F. Hayhurst : *Cypripedium* \times *Rolfei* var.

Thomas J. Finnie, Esq. : *Cattleya labiata*.

A. Meyer, Esq. : *Laeliocattleya* \times 'Ledru Rollin' ('Carmen' \times 'Fabia').

Pantia Ralli, Esq. : *Brassocattleya* \times *Cliftonii*.

Messrs. Davidson : rare Orchids.

Messrs. McBean : hybrids.

Messrs. Armstrong & Brown : new hybrids.

Messrs. J. Cypher : a group.

Messrs. Flory & Black : *Zygopetalum* \times *Blackii* (*Z. crinitum* \times *Z. Perrenoudii*).

ORCHID COMMITTEE, NOVEMBER 3, 1914.

Mr. J. GURNEY FOWLER in the Chair, and eighteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, for rare Orchids.

To Messrs. Sander, for a group.

Silver Banksian Medal.

To Messrs. Stuart Low, for a group.

First-class Certificate.

To *Sophrolaelia* \times 'Felicia,' Fowler's variety (*S.-l.* \times *heatonensis* \times *L. pumila*) (votes, unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Tunbridge Wells (gr. Mr. J. Davis). A fine hybrid with perfectly-formed flower of a bright ruby-purple shade, with an underlying tint of orange-scarlet. The original form (A.M. March 3, 1908) had the smaller and more tubular-lipped *L. pumila praestans* of gardens as one of the parents ; the present variety is from the true large-flowered *L. pumila*.

Award of Merit.

To *Cattleya* \times 'Astron' (*Harrisoniana alba* \times *Dusseldorfei* 'Undine') (votes, unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flower pure white. The award was made July 28, but withdrawn, as the flower could not be painted for the Society's collection of paintings of certificated plants, now numbering 2190. The award was now confirmed, as the picture was obtained.

To *Laeliocattleya* \times 'Neleus' var. 'Sunspot' (*C.* \times 'Iris' \times *L.-c.* \times 'Ophir') (votes, unanimous). The plant bore a three-flowered inflorescence. Sepals and petals chrome-yellow, with a pale green shade. Lip reddish crimson, with gold lines.

To *Cypripedium* \times 'Nirvana' (parentage unrecorded) (votes, 10 for, 5 against), from W. R. Lee, Esq., Plumpton Hall, Heywood (gr. Mr. Branch). A large flower of good shape, pale green tinged

with purple, the broad dorsal sepal being pure white, with a green base.

To *Odontoglossum* × 'Irene' (*Uro-Skinneri* × *Thompsonianum*) (votes, unanimous), from Messrs. Charlesworth. Flowers of good substance, the ground colour white, but blotched over the greater part of the surface with claret-red.

Other Exhibits.

E. Whiteaway, Esq.: *Brassolaeliocattleya* × 'Surprise' (*C. bicolor* × *B.-l.* × *Digbyano-purpurata*).

W. R. Lee, Esq. *Odontoda* × *Schroderi*, Lee's variety.

Messrs. Armstrong & Brown: hybrids.

Mr. E. V. Low: six forms of white-petalled *Cattleya labiata*.

Messrs. Flory & Black: *Anguloa Cliftonii*.

ORCHID COMMITTEE, NOVEMBER 17, 1914.

Mr. J. GURNEY FOWLER in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, for a group.

To Messrs. Sander, for hybrids and rare species.

To Messrs. Stuart Low, for a group.

To Messrs. Jas. Cypher for Cypripediums.

Award of Merit.

To *Sophrocattleya* × 'November' (*Cattleya* × 'Portia' × *Sophronitis grandiflora*) (votes, unanimous), from J. Gurney Fowler, Esq., Brackenhurst, Pembury (gr. Mr. J. Davis). Flowers of good shape; the ovate-oblong sepals and broad petals bright rose-purple with a gold shade. Lip ruby-red, with chrome-yellow disc.

To *Odontoglossum crispum* 'Millie' (votes 16 for, 1 against) from Messrs. Flory & Black, Slough. A very large typical white form, with a pale purple shade on the sepals.

Cultural Commendation.

To Mr. J. Davis, gr. to J. Gurney Fowler, Esq., for *Odontoglossum* × *Lambeauianum*, with a large branched spike of fifty-three flowers.

Other Exhibits.

Sir Jeremiah Colman, Bart.: *Dendrobium Tofftii*.

Messrs. McBean: *Sophrocattleya* × 'Pearl' (*S.-c.* × 'Doris' × *C.* × 'Portia').

Messrs. Hassall: Cattleyas.

Messrs. Flory & Black: *Zygocolax* × *Veitchii*.

John T. Bennett-Poë, Esq.: *Brassocattleya* × 'Madame Chas. Maron'

ORCHID COMMITTEE, DECEMBER 1, 1914.

Mr. J. GURNEY FOWLER in the Chair, and twenty members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Charlesworth, for a group.

To Messrs. Sander, for a group.

Silver Banksian Medal.

To Messrs. McBean, for Cattleyas &c.

To Messrs. Stuart Low, for a group.

Award of Merit.

To *Brassocattleya* × 'Admiral Jellicoe' var. 'Pink Pearl' (*B.-c.* × *Digbyano-Mossiae* × *C.* × 'Lord Rothschild') (votes, 15 for, 1 against), from Messrs. Stuart Low, Jarvisbrook, Sussex. Flowers Cattleya-like in form, but with a fringed lip. Lilac-pink, with pale yellow disc to the lip.

Other Exhibits.

His Grace the Duke of Marlborough: *Brassocattleya* × 'Ida' (*B.-c.* × 'Pluto' × *C. Dowiana aurea*).

J. Gurney Fowler, Esq.: four hybrids.

Messrs. Davidson: *Odontoglossums*.

Messrs. Flory & Black: *Cypripediums*.

Messrs. Hassall: hybrid Cattleyas.

Mr. C. F. Waters: *Anguloa Ruckeri* and *Odontoglossums*.

ORCHID COMMITTEE, DECEMBER 15, 1914.

Mr. J. GURNEY FOWLER in the Chair, and nineteen members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Charlesworth, for Miltonias, *Odontoglossums*, &c.

To Messrs. Sander, for hybrids and rare species.

To Messrs. J. Cypher, for *Cypripediums*.

Silver Banksian Medal.

To Messrs. Stuart Low, for a group.

Award of Merit.

To *Laeliocattleya* × 'Sir Douglas Haig' (*L.-c.* × 'Henry Greenwood' × *C.* × 'Octave Doin') (votes, unanimous), from Messrs. Sander, St. Albans. In shape the flowers are nearest to the Cattleya parent. Sepals and petals white. Lip violet-purple in front, with a yellow disc, and rose veining on the outside of the side lobes.

Cultural Commendation.

To Mr. J. E. Shill, gr. to Baron Bruno Schröder, The Dell, Englefield Green, for *Odontoglossum crispum* 'Leonard Perfect' with two spikes of fifteen and fourteen flowers.

Other Exhibits.

J. Gurney Fowler, Esq. : flowers of new hybrids.

R. Windsor Rickards, Esq., Usk Priory : hybrids.

Pantia Ralli, Esq. : *Odontioda* × 'Brunette.'

H. S. Goodson, Esq. : *Sophrocattleya* × 'Annette.'

R. G. Thwaites, Esq. : hybrid Cattleyas.

Walter Cobb, Esq. : *Odontoglossum* × *percultum*, Cobb's var.

Messrs. McBean : *Sophrocattleya* × 'Pearl.'

Messrs. Flory & Black : *Laeliocattleyas*.

William Bolton, Esq. : *Cypripedium* × *Boltoni* from seed.

DAHLIA SHOW.

TUESDAY, SEPTEMBER 8, 1914.

THE JUDGES.

Bridge, Rev. A., Worth Rectory, Three Bridges.
 Cory, Reginald, Duffryn, Cardiff.
 Cuthbertson, W., V.M.H., Maitland Lodge, Duddingston.
 Green, J., 17 Burlington Avenue, Kew Gardens.
 Jones, H. J., Ryecroft Nursery, Lewisham.
 May, H. B., V.M.H., The Plas, Chingford.
 Moorman, J. W., 33 Wetherell Road, S. Hackney.
 Riding, J. B., The Nurseries, Chingford.
 Turner, A., Royal Nurseries, Slough.

Class 1. Amateurs.—A group of Decorative Garden Dahlias of all or any sections. Twelve feet run of 3 feet tabling, not to be built up more than 8 feet in height from the ground level to the top of the flowers.

First Prize :—R.H.S. Silver Cup.

1. Rev. A. Bridge, Worth Rectory, Three Bridges.

Class 2. Open.—A group of Decorative Garden Dahlias. Twenty-five feet run of 3 feet tabling, not to be built up more than 8 feet in height from the ground level to the top of the flowers.

First Prize :—Seventy-five Guinea Challenge Cup, presented to the R.H.S. by Reginald Cory, Esq.

Challenge Cup : Messrs. J. Cheal, Crawley.

Silver Cup : Messrs. Carter Page, London Wall.

Silver-gilt Flora Medal : J. Walker, Thame, Oxon.

Silver Flora Medal : J. Emberson, Walthamstow.

Silver Flora Medal : Messrs. Keynes, Williams, Salisbury.

FIFTH ANNUAL EXHIBITION OF VEGETABLES.

HELD IN THE CENTRAL HALL, WESTMINSTER, S.W., SEPTEMBER 22,
1914.

THE JUDGES.

Bates, W., The Gardens, Cross Deep, Twickenham.
Fielder, C. R., V.M.H., Great Warley, Brentwood, Essex.
Molyneux, E., V.M.H., Swanmore Park Gardens, Bishops Waltham.
Mortimer, S., Rowledge, Farnham, Surrey.
Pearson, A. H., J.P., V.M.H., The Hut, Lowdham, Notts.
Pope, W., The Gardens, Welford Park, Newbury.
Poupart, W., Marsh Farm, Twickenham.
Senn, C. H., 329 Vauxhall Bridge Road, S.W.
Thomas, O., V.M.H., 25 Waldeck Road, Ealing.

OFFICIAL PRIZE LIST.

THIS EXHIBITION WAS OPEN TO AMATEURS ONLY.

The Owner's name and address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.

Collections.

N.B.—A competitor could enter in only one of the first three Classes. Arrangement was taken into consideration by the Judges.

Class 1.—Twelve kinds distinct, to be selected from the subjoined list : Beet, Brussels Sprouts, Cabbage, Broccoli or Cauliflower, Carrot, Celery, Cucumber, Endive, Leek, Lettuce, Mushroom, Onion, Parsnip, Pea, Potato, Tomato, Turnip, Bean, Runner or French, Vegetable Marrow.

First Prize, The Sutton Challenge Cup (value £21) and £10 ; Second, £5 ; Third, £3 ; Fourth, £2.

1. Hon. Vicary Gibbs, Aldenham House, Elstree (gr. Mr. E. Beckett).

2. T. Jones, Esq., Bryn Penylan, Ruabon, Wales.

No other award.

Class 2.—Nine kinds distinct, to be selected from the list in Class 1.

The object of this Class is to illustrate especially the quality and size of vegetables most acceptable and useful for table use.

N.B.—The Judges are authorized to disqualify any exhibit which they consider does not contain the most suitable vegetables, or contains specimens which are not in the most suitable condition in regard to size and quality for table use.

In 1913 these Prizes were withheld on account of the excessive size of the specimens, the Judges considering them too large for table use, except perhaps in hotels and restaurants.

First Prize, £5 ; Second, £3 ; Third, £2 ; Fourth, £1.

1. Lord North, Wroxton Abbey, Oxon. (gr. Mr. E. R. Janes).
2. Rev. T. McMurdie, Woburn Park, Weybridge (gr. Mr. A. Basile).
3. Sir Montagu Turner, Bedfords, Havering, Essex (gr. Mr. A. Humphrey).
4. Col. R. Knox, Holt Hatch, Alton, Hants (gr. Mr. W. West).

Class 3.—Six kinds distinct, to be selected from the list in Class 1. Number of specimens as stated.

First Prize, £3 ; Second, £2 5s. ; Third, £1 10s. ; Fourth, 15s.

1. Rev. J. Davies, Crowle Vicarage, Worcester.
2. Mr. H. Keep, Aldermaston, Reading.
3. G. Thorn, Esq., Sprotlands, Willesboro', Ashford (gr. Mr. M. Hoad).

Class 4. Potatos, collection of twelve varieties distinct.

First Prize, £3 ; Second, £2 ; Third, £1.

1. Mrs. Denison, Little Gaddesden, Berkhamsted (gr. Mr. A. G. Gentle).
 2. G. Thorn, Esq.
 3. Mr. A. G. Nichols, Strathfieldsaye, Mortimer, Berks.
- Competitors in Class 4 cannot enter in Class 5.

Class 5.—Potatos, collection of six varieties distinct.

First Prize, £1 10s. ; Second, £1 ; Third, 10s.

1. Rev. T. McMurdie.
2. Mr. T. Butcher, Dering Road, Ashford, Kent.
3. Sir Montagu Turner.

Class 6.—Onions, collection of six varieties distinct, as follows :—

2 dishes of the ' Ailsa Craig ' type, one oval and the other round.

1 dish of Red Onions.

1 dish of Silverskins.

1 dish of James', or other selection of long-keeping brown globe Onions.

1 dish of White Spanish or Nuneham Park type (flat, not globe).

N.B.—More than 2 dishes of selections of Ailsa Craig type, or varieties indistinguishable from it, will disqualify.

First Prize, £2 ; Second, £1 ; Third, 10s.

1. Lord North.

Class 7.—Salads, collection of nine kinds distinct, each kind to be staged separately.

First Prize, £3 10s. ; Second, £2 10s. ; Third, £1 5s.

1. Hon. Vicary Gibbs.
2. T. Jones, Esq.

Competitors in Class 7 cannot enter in Class 8.

Class 8.—Salads, collection of six kinds distinct, each kind to be staged separately.

First Prize, £2 5s. ; Second, £1 10s. ; Third, 15s.

1. Lord North.

Class 9.—Other Vegetables, six kinds distinct, to be selected from the following :—Cardoon, Capsicum or Chili, Celeriac, *Stachys tuberosa*, Seakale, Egg Plant, Jerusalem Artichoke, Salsify, Scorzonera, Kohl Rabi, Couve Tronchuda.

First Prize, £2 10s. ; Second, £1 10s. ; Third, 15s.

1. Hon. Vicary Gibbs.
2. Lord North.

Single Dish Classes.

In Classes 10-40 the First Prize is in each case 10s.; the Second, 7s. 6d.; Third, 5s. The specimens shown in each Class must be always of one and the same variety.

Class 10.—Beans, Scarlet Runners.

1. Lord North.
2. Mr. H. Keep.
3. Col. R. Knox.

Class 11.—Beans, French Climbers.

1. Rev. T. McMurdie.
2. Hon. Vicary Gibbs.
3. Mr. H. Keep.

Class 12.—Beans, French Dwarf.

1. Sir Montagu Turner.
2. Col. R. Knox.
3. Hon. Vicary Gibbs.

Class 13.—Beet, Globe type.

1. T. Jones, Esq.
2. Mrs. Denison.
3. Hon. Vicary Gibbs.

Class 14.—Beet, Long type.

1. Lord North.
2. Mr. F. L. Pike, Serge Hill, King's Langley.
3. Hon. Vicary Gibbs.

Class 15.—Brussels Sprouts, 50 buttons.

1. Hon. Vicary Gibbs.
2. T. Jones, Esq.
3. Mr. H. Keep.

Class 16.—Brussels Sprouts, three plants.

1. Hon. Vicary Gibbs.

Class 17.—Cabbage.

1. Hon. Vicary Gibbs.
2. Lord Foley, Ruxley, Lodge, Claygate (gr. Mr. H. C. Gardner).
3. G. Thorn, Esq.

Class 18.—Cabbage, Savoy.

1. Mr. F. L. Pike.
2. Lord Foley.
3. F. Bibby, Esq., Hardwicke Grange, Shrewsbury (gr. Mr. J. Taylor).

Class 19.—Cauliflower or Broccoli

1. Hon. Vicary Gibbs.
2. T. Jones, Esq.
3. Col. R. Knox.

Class 20.—Celeriac.

1. Lord North.
2. Hon. Vicary Gibbs.
3. Rev. T. McMurdie.

Class 21.—Celery, White.

1. Mr. H. Keep.
2. Hon. Vicary Gibbs.
3. Sir Francis Lloyd, Aston, Oswestry (gr. Mr. W. Staward).

Class 22.—Celery, Red.

1. Mr. H. Keep.
2. Hon. Vicary Gibbs.
3. Rev. T. McMurdie.

Class 23.—Cucumbers.

1. Hon. Vicary Gibbs.
2. Lord Foley.

Class 24.—Leeks.

1. Hon. Vicary Gibbs.
2. F. Bibby, Esq.
3. Lord North.

Class 25.—Marrows.

1. Hon. Vicary Gibbs.
2. Sir Montagu Turner.
3. Mr. F. L. Pike.

Class 26.—Mushrooms.

No Award.

Class 27.—Onions.

1. Hon. Vicary Gibbs.
2. Lord North.
3. H. S. Bartleet, Esq., Severndroog, Shooter's Hill.

Class 28.—Parsnips.

1. Lord North.
2. Hon. Vicary Gibbs.
3. T. Jones, Esq.

Class 29.—Carrots, Long.

1. Hon. Vicary Gibbs.
2. Lord North.
3. Rev. J. Davies.

Class 30.—Carrots, Stump-rooted or Short.

1. Mrs. Denison.
2. Lord North.
3. Mr. F. L. Pike.

Class 31.—Peas.

1. Mr. H. Keep.
2. Hon. Vicary Gibbs.

Class 32.—Turnips, White Skin and Flesh.

1. Mrs. Denison.
2. Mr. H. Keep.
3. Hon. Vicary Gibbs.

Class 33.—Turnips, purple-top, red-top, or green-top, flesh white.

1. Mrs. Denison.
2. Mr. H. Keep.
3. Hon. Vicary Gibbs.

Class 34.—Turnips, Yellow flesh.

1. Hon. Vicary Gibbs.
2. T. Jones, Esq.
3. F. Bibby, Esq.

Class 35.—Potatos, White.

1. Mrs. Denison.
2. Mr. A. G. Nichols.
3. Mr. T. Butcher.

Class 36.—Potatos, Coloured.

1. Hon. Vicary Gibbs.
2. Rev. T. McMurdie.
3. Mrs. Denison.

Class 37.—Kale, Curled.

1. Mr. F. L. Pike.
2. Hon. Vicary Gibbs.
3. Sir Montagu Turner.

Class 38.—Tomatos, Red.

1. Lord Foley.
2. Sir Montagu Turner.
3. Col. R. Knox.

Class 39.—Tomatos, Yellow.

1. Hon. Vicary Gibbs.
2. Lord North.
3. Lord Foley.

Class 40.—Any other Vegetable not named in the Schedule.

1. Sir Montagu Turner, Artichokes.
2. Rev. T. McMurdie, Red Cabbage.
3. Hon. Vicary Gibbs, Spinach.

CHAMPION CHALLENGE CUP.

A Champion Cup will be held for one year (subject to a guarantee of its return in good condition) by the winner of the greatest number of First Prize points throughout the whole Exhibition, the winner in Class 1 being excluded. An Exhibitor may win this cup only once in three years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative Cup. In calculating for this Champion Cup the number of points reckoned for each First Prize will be as follows :—

Class 2	.	.	.	.	.	.	.	9 points each
Classes 3, 4, 7	.	.	.	.	.	.	.	6 „ „
Classes 5, 6, 8, 9	.	.	.	.	.	.	.	4 „ „
All other Classes	.	.	.	.	.	.	.	1 point „

Lord North, 21 points.

CERTIFICATES OF DILIGENT INTEREST IN PLANTS.

CERTIFICATES of Diligent Interest in Plants have been awarded to the following children during 1914 as follows :—

Mabel Buzzard. First in Whissendine School Daffodil Competition, March 6.

Albert Alexander. First in Bransgore School Tulip Competition, March 21.

Reuben Jose. First in Bransgore School Daffodil Competition, March 21.

Violet Rushton. First in Waterloo Wesleyan School Competition for best kept Garden Plot, September 7.

In March the Royal Drawing Society sent selected studies from their young people's Competitions for the consideration of the Council. Certificates were awarded to :—

Grace Watson, Birkenhead, for a colour brush study of plant growth in light and darkness, March 26.

Annie Smith, Bristol, for microscopic study of the life-history of Selaginella, March 26.

Ada Vinson, Gravesend, for colour study of opening bud of the Horse Chestnut, March 26.

Gladys Foster, Gravesend, for colour drawings of twelve Dehiscent Fruits, March 26.

The following letter was sent to the Royal Drawing Society :—

“ It is with great pleasure that our Society has examined the specimens bearing on horticultural and botanical study which have been submitted to us by the Royal Drawing Society. It is immediately evident that the Royal Drawing Society is doing excellent work which must bear good fruit in the future, not simply to the art and science of drawing, but to all those kindred arts and sciences which are so dependent on accurate delineation for the production of reliable records. The specimens which have been submitted to us, although executed by students of only fifteen to eighteen years of age, are in themselves evidence of most exact observation, and are worthy to rank with the productions which illustrate our best gardening and botanical books. Our Society feels that it owes a real debt of gratitude to the Royal Drawing Society for thus training and encouraging young people to fit themselves for the accurate and exact delineation of plants and plant life from their own personal observation and study.
—March 26, 1914.”

HORTICULTURAL SUNDRIES.

AWARDS MADE IN 1914.*

Sprayers and Syringes.*Award of Merit.*

† "Cambridge" Knapsack Sprayer, from Messrs. H. Hartjen, 35 Noble Street, London, E.C. The body of this sprayer is made of Virex brass alloy, a material said to be resistant to all ordinary spraying liquids; capacity $3\frac{1}{2}$ gallons; pump internal, of the rubber diaphragm type, worked by a lever fitted to the left-hand side of the base and a long rod operating a short lever at the top of the machine; the body of the machine forms the air-chamber; agitator large, efficient, operated by pump lever; valves rubber; strainer brass wire gauze; simple and strong clip to secure the lid; nozzle double "Vermorel"; lance 30 inches, brass, fitted with a tap.

Highly Commended.

"Little Wonder" Dry Powder Distributor, from the Four Oaks Spraying Machine Co., Sutton Coldfield, Birmingham. Body of machine soundly constructed of tin-plate, capacity 18 lb. of sulphur; lid large; pump of the diaphragm type, the leather of which is easily replaceable; lance 30 inches, of tin-plate, rather weak; rubber hose; two nozzles supplied. The spray is regulated by a milled screw operating a slide over the powder aperture. All parts are accessible and apparently little likely to get out of order.

Commended.

"Peerless" Syringe No. 7, from Messrs. G. & W. Purser, Ltd., Palmer Street, Birmingham. Barrel, brass, plain, 1 inch by 20 inches; three nozzles, giving fine, medium, and coarse sprays; spray-maker accessible; brass ball valve; cotton-waste packing; no strainer; efficient sleeve drip protector; spare nozzles mounted on syringe.

"Streetley" Pneumatic Sprayer, from the Four Oaks Spraying Machine Co. Body of copper, riveted; capacity 3 pints liquid; carrying handle at side; pump internal, efficient; washers leather; valves brass and leather, operated by a small steel spring; lance brass, fitted with tap; nozzle good; pump handle secured by a neat clip. The steel valve spring should be replaced by one made of a non-rusting metal.

* These awards stand for ten years only and lapse in 1924.

† The order of entry is purely accidental, and has no reference to merit.

Insecticides.*Award of Merit.*

"Katakilla" Powder Insecticide Wash, from Messrs. McDougall, Port Street, Manchester. This preparation was tried on fruit trees of different kinds and on roses, especially for aphid attack. It gave excellent results, in most cases completely clearing the trees of the pest. It was also tried on black fly of bean with like results. No damage whatever was done to foliage. The preparation is easy to mix and apply by any ordinary spraying machine.

Highly Commended.

"Carlton" Arsenate of Lead, from Messrs. Voss, Glengall Road, Millwall, E. This preparation was used against the caterpillars of winter moth, &c., on fruit trees. It was easily mixed and applied, and proved deadly to the caterpillars.

Soluble Green Fly Insecticide, from Mr. Henry Morris, Baltic Works, Newport, Mon. The preparation was tried against aphid in the greenhouse, on Cinerarias, Pelargoniums, and potatoes. The aphid was killed without damage to the plants. It was also used outdoors on roses with the same beneficial result.

Garden Implements and Appliances.*Highly Commended.*

"Nuespray" Lawn Sprinkler, from Mr. J. Singleton, Fulwood, near Preston. A strongly-made lawn sprinkler with an ingenious and simple adjustable spray-maker, giving fine or coarser sprays as desired. The spray is made by force of water on a flat circular disc with a bevelled edge, and in one form, with several small perforations.

"Pluviette" Lawn Sprinkler, from Messrs. Lloyd Lawrence, 29 Worship Street, London, E.C. The machine is soundly constructed of cast-iron, and is unlikely to get out of order. The spray is made by the projection of a jet of water on a wheel, fitted with blades at its periphery, which moves in a vertical plane. This wheel rotates itself and the jet in a horizontal plane by friction drive on a circular rim. The spray is distributed very evenly over a circle sixteen yards in diameter.

Commended.

"No. 2 Can," Special Nursery Quality, from Mr. Haws, 227 Lower Clapton Road, London, N.E. A round can of 1 gallon capacity, strongly constructed of japanned tin-plate, strengthened and protected by galvanized wire and strips at parts liable to damage in lifting the can from a tank. Fitted with three excellent roses.

"Shelf Watering Can," from Mr. Haws, 227 Lower Clapton Road, London, N.E. A round can of 2 quarts capacity, constructed of stout galvanized iron, spout 9 inches long, with an extra joint and one rose. A detachable handle is fitted to the base rim of this can, enabling it to be used above the worker's head.

"Shelf Watering Can" with pear-shaped body, from Mr. Haws, 227 Lower Clapton Road, London, N.E. A wedge-shaped can made of stout japanned tin-plate. Its form makes it convenient for use on wide shelves or amongst plants stood on inverted pots on a stage. Fitted with a curved spout joint and one rose.

"New Bulb and Rock Garden Hoe," from Messrs. Barr, 12 King Street, Covent Garden. A small hoe, the blade of which is the size and shape of a cleek-head, fastened by the narrower end at right angles to the ash handle. It is very useful for hoeing among close-planted rows, or in small beds such as are found on Rock Gardens.

Hand Garden Cultivators, from Messrs. Barr, 12 King Street, Covent Garden. A set of tools consisting of long, detachable, curved, spring-steel teeth set in strong ash handles. They were found excellent for stirring the soil, for removing such weeds as couch, and for dragging weed (*Villarsia*) from the lily ponds. Three sizes were submitted: (1) "The Cuma," which had three teeth and was 21 inches in length; (2) "The Caxton," which had three teeth and was 4 feet long; (3) "The Buco," which had five teeth and was 4½ feet long. This was considered to be useful only for light soils.

Garden Spade, from The Hardy Patent Pick Co., Sheffield. A well-made and well-balanced tool which wears well.

Garden Fork, from The Hardy Patent Pick Co., Sheffield. A good tool, strong, light, and durable.

Miscellaneous.

Commended.

"The Fothergill Flower Press," from Dr. C. Fothergill (Atlas Manufacturing Co., Stanley Road, Woodford, Essex). The press is composed of two frameworks of stout wire, 14 inches long and 9 inches wide, covered with thin wire mesh. The plants to be dried are laid between layers of wadding, of the same size as the grids between which they are placed, and tightly bound together by webbing straps. The whole press may be put before a fire, when the drying proceeds rapidly.

Other subjects were submitted for trial by the following firms:—

Messrs. Acme Chemical Co., Tonbridge; Andrews, Bickley; Barr, Covent Garden; Bentley, Barrow-on-Humber; Boundary Chemical Co., Liverpool; Cooke, Glasgow; Cooper, Berkhamsted; Evans, Stratford-on-Avon; Four Oaks Co., Sutton Coldfield; Gardener, Finsbury Park; Gripper Mfg. Co., Leicester; Hartjen, Noble Street, E.C.; Jeyes, Cannon Street, E.C.; Moss, Fleet; Napier, Eastry; Price, Battersea; Purser, Birmingham; Richards, Borough High Street, S.E.; Robinson, West Bromwich; Schoberts, Leadenhall Street, E.C.; Singleton, Fulwood; Sutton, Gomersal; The British Challenge Glazing Co., Tooley Street, E.C.; The S.P. Charges Co., St. Helens; Voss, Millwall; Walters, Bilton; Welch, Bournemouth; West, Higham Hill; Wood, Walworth Road, S.E.

ESTABLISHED
1804.



INCORPORATED
1869.

TELEGRAMS:
"HORTENSA
SOWEST LONDON."

TELEPHONE:
VICTORIA 5368.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

- | | |
|--------------------------------------|--|
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| 2. Letters. | 20. Spring and Summer Shows. |
| 3. Telephone and Telegrams. | 21. Gladiolus Shows. |
| 4. Journals Wanted. | 22. Saxifrage Conference. |
| 5. Subscriptions. | 23. National Diploma in Horticulture. |
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| 16. Trials at Wisley. | 34. Advertisements. |
| 17. Tulip Show. | |
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Douglas' Journal, *see* page CCXXXIII.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W., except those specially connected with Wisley, which should be addressed—The Director, R.H.S. Gardens, Wisley, Ripley, Surrey.

3. TELEPHONE AND TELEGRAMS.

Telephone Number : **VICTORIA 5363.**

"HORTENSIA SOWEST LONDON" is sufficient address for telegrams. This address counts as two words only.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment not even one can be supplied owing to the stock of the following being exhausted :—

Vols I. to VI.

Vol. XIII. Part I.

Vol. X.

Vol. XIV.

These are, therefore, particularly asked for.

5. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year ; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription ; if elected after the 1st of October and before the 1st of January, he pays the full amount of his subscription for the year commencing the 1st day of January then next, and no further subscription until the next succeeding 1st of January. To avoid the inconvenience of remembering their subscriptions Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments ; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society ; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly

note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £....., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

See page 126 in the "Book of Arrangements," 1915.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once.

9. NEW FELLOWS.

The increasing number of Fellows shows plainly the useful work the Society is doing, and its value to all lovers of the Garden. The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as it is most important to fill the places of those who are taken from us.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Help towards the Wisley Endowment.
3. Providing Lectures with Lantern Slides.
4. Presenting Books for the Library at Vincent Square and at Wisley.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund (p. 493), the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to make up this sum?

5. Sending new or rare Plants and Seeds for the Garden, Sedums for nomenclature purposes, and surplus Roots for distribution to the Fellows.

The Secretary asks for help in the ways above indicated.

11. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1915 contains a considerable quantity of new information, and is compiled more especially for the single-handed gardener. Fellows may obtain it post free, 1s. 1d., from the R.H.S. Office, Vincent Square, London, S.W.; or 2s. 1d. if leather-bound.

N.B.—By an error, a fortnightly meeting has been entered in the Diary for Wednesday, August 18. This should be Tuesday, August 17. Will Fellows please correct their copies?

12. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the Annual Meeting in 1914 for the further development of the practical and scientific work at Wisley, Fellows will be pleased to know that the Council have been fortunate in securing the services of Dr. Keeble, F.R.S., as Director, of Professor Lefroy, M.A., of the Imperial College, as Entomologist, and of Mr. Harold J. Page, B.Sc., as Chemist. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of the Society and the Imperial College. All communications to the Gardens should in future be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

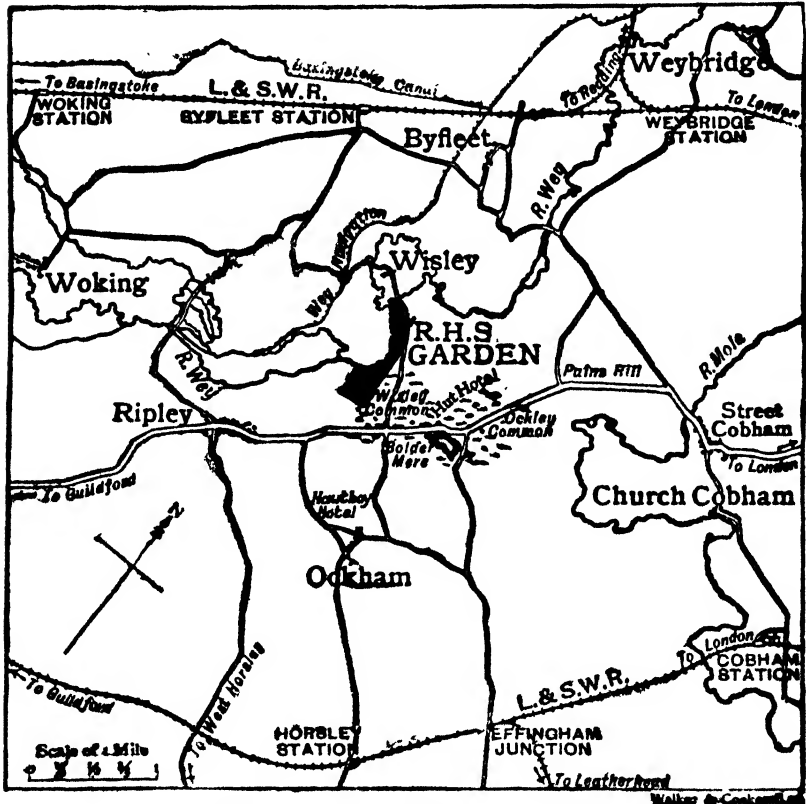
Mr. F. J. Chittenden, F.L.S., who has done such splendid work in the Laboratory and as Head of the School of Horticulture since 1907, will still continue in this capacity under the re-organization scheme, and Mr. Wright will similarly continue his work in the Garden.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8s.; or waiting three hours, 10s.; or to and from Horsley, Effingham, or Byfleet, 7s. Motor cars will be found at Byfleet Station, 7s. 6d. the

return journey. Accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy, Ockham.

For the motor route from London, 21 miles from Hyde Park Corner, see "Book of Arrangements," p. 166.



POSITION OF THE SOCIETY'S GARDENS.

13. ROCK GARDEN AT WISLEY.

In response to the interest taken in what are popularly called "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that.

An Alpine House has been built above the Rock Garden, for the purpose of growing rock plants to perfection which blossom too early to withstand our wet winters and late spring frosts.

14. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

15. DISTRIBUTION OF SURPLUS PLANTS.

A few years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded ; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants ? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the " Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot ; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out

of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries ; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

16. TRIALS AT WISLEY.

The Regulations for the Trials at Wisley have been revised, with a view of improving this important branch of the Society's work. For fuller information concerning them and the list of subjects invited for trial in 1915, 1916, and 1917, *see* pages 42 and 167, *et seq.*, "Book of Arrangements" for 1915.

17. TULIP SHOW.

A Show of May-flowering Tulips will be held in May 1915, cut blooms only, for the purpose of further enabling the Nomenclature Committee to decide on the synonyms of the varieties sent.

R.H.S. Medals will be given to collections and Awards made to species and varieties at the discretion of the Council.

May 12.—The Hall will be available for staging at Noon.

May 13.—Staging must be completed by 9 A.M., when the Committee will commence their work. The Committee *only* will be allowed in the Hall on the 13th.

May 14, at 9 A.M.—Committee will continue their work. At 11 A.M., private exhibitors and two members of each exhibiting firm will be admitted, but no one else. At 1 P.M., R.H.S. Fellows will be admitted by their tickets, and the public on payment of 1s.

A full collection of standard varieties of May-flowering tulips will be brought from Holland for comparison.

All British growers are invited to send blooms.

18. TRIAL OF HORTICULTURAL SUNDRIES.

The Council will continue the Trials of Sundries in 1915, and

Sundriesmen are again invited to send their specialities. (*See* pp. 44 and 171, "Book of Arrangements," 1915.)

19. EXHIBITIONS, MEETINGS, AND LECTURES, 1915.

The Programme will be found in the "Book of Arrangements" for 1915. A reminder of every show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (34) of halfpenny cards *ready addressed* to himself.

20. SPRING AND SUMMER SHOWS.

The Great Spring Show will be held at the Royal Hospital Gardens, Chelsea, on May 18, 19, 20. The scheme of Tenting and Arrangements generally will be similar to those of past years.

The Summer Show will be held at Holland House, Kensington, on July 6, 7, and 8.

21. GLADIOLUS SOCIETY'S SHOWS.

Since the "Book of Arrangements" for 1915 was printed, the Council have given their consent for two Shows of the Gladiolus Society to be held in conjunction with the R.H.S. fortnightly meetings on Tuesday, July 20, and Wednesday, August 4.

22. SAXIFRAGE CONFERENCE.

In consequence of the War the Conference on Saxifrages announced for April 28, 1915, will be postponed.

23. A NATIONAL DIPLOMA IN HORTI- CULTURE.

Most gardeners will welcome the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations which will be required. The Diploma will be thoroughly "National," for by the consent of H.M. Government, the Department of Agriculture, after being approached on the matter, consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized that the Diploma shall bear the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations will be practical, viva voce, and written. The practical part will be held in suitable gardens at convenient centres in the country. A Preliminary Examination (the first was held in June 1914) will be held annually. The first Final Examination will be held in June 1915 about the same time as the Second Preliminary. The Final is open only to those who have passed the Preliminary and can produce a Certificate showing they have been employed regularly for not less than six years in the Practice of Horticulture.

Among those for whose benefit the Diploma is established are the following:—Florists, Fruit Growers, Gardeners, Horticultural Inspectors, Horticultural Instructors (not School Teachers giving instruction in other subjects), Landscape Gardeners, Market Gardeners, Nurserymen, Public Park Gardeners, and Seedsmen.

Full information may be obtained from the Secretary, Royal Horticultural Society, Vincent Square, S.W.

24. EXAMINATIONS, 1915.

1. The Annual General Examination in the Principles and Practice of Horticulture will be held on March 31, 1915. It has two divisions, viz. (a) for Candidates of eighteen years of age and over, and (b) for Juniors *under* eighteen years. Particulars for 1915 may be obtained by sending a stamped and directed envelope to the Society's offices. Copies of the Questions set from 1893 to 1914 (price 2s. post free) may also be obtained from the office. The Society is willing to hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Royal Horticultural Society, to be awarded after the 1915 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 14, 1915. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The conduct of this

Examination is on similar lines to that of the General Examination. Questions on Elementary Chemistry and Biology are included.

Medals and Certificates are awarded, and Class Lists published, in connexion with these Examinations.

25. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

26. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3s. for one day (or £5 5s. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner*.

27. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 330 Societies have joined our ranks, and the number is steadily increasing.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3s. 6d. for 10 copies, 5s. 6d. for 20, 11s. 6d. for 50, 20s. for 100. At the request of several of the Affiliated Societies, the Council have had the Certificate Card coloured. The coloured Card is sold at 8d. a single copy, or 10 for 5s., post free.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5s. 6d., with case complete; Silver, 12s. 6d., with case complete; Silver-gilt, 16s. 6d., with case complete. Award Cards

having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d.* each.

28. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. It contains a useful Index and several important amendments. Special attention is drawn to the new "Rules for Judging Cottage and Allotment Gardens," with the companion "Judges' Point Sheet" (see paragraph 29), and a "Classification of Stove, Greenhouse, and Hardy Plants for Show Purposes." The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 6*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

29. RULES FOR JUDGING COTTAGE AND ALLOTMENT GARDENS.

To assist Allotment Holders and Cottage Gardeners in their competitions, a set of Rules, with hints to both Exhibitors and Judges, has been drawn up. These Rules may be had at twopence a copy, or fifty for 7*s.* 6*d.*

A companion Judges' Sheet in a very convenient book-like form can also be had for 2*s.* a dozen. This Judges' Sheet has, in tabulated form, a list of the plants usually grown in allotment gardens, flower gardens, and for window and wall decoration. The allotments or gardens to be judged are all numbered, and columns are provided in the judging sheet for the points given.

30. R.H.S. DAFFODIL YEAR BOOK.

The Daffodil Year Books of the Society are amongst the most interesting works on gardening. The first issue (1913) was sold out within a month of publication. Double the quantity of the 1914 Year Book was printed, and of this only a few copies remain unsold. It has 140 pages of letterpress (with 36 illustrations), of clear, reliable information, and it makes pleasant reading. These Year Books are well worthy of a place in Fellows' libraries alongside the Journals.

Many Societies are not holding their usual Daffodil Shows this year owing to the War. It has therefore been decided not to issue a Year Book in 1915, but to hold over all reports &c. for the 1916 issue.

31. R.H.S. PUBLICATIONS.

In future, Fellows can obtain the Society's publications only from the R.H.S. Office, Vincent Square, S.W. Non-Fellows should order direct from Messrs. Wesley, 28 Essex Street, Strand, W.C., who have been appointed Agents for the Society.

32. DISBUDDING OF ORCHIDS.

At the request of the Orchid Committee the Council have made a rule that "Awards will not be given to any Orchids of which the natural size and character of the flowers have, in the opinion of the Orchid Committee, been in any way changed or improved through the removal of a bud or buds, or part of the spike."

33. DISBUDDING CHRYSANTHEMUMS.

When single-flowered Chrysanthemum plants are submitted for certificate, one plant must be shown without any disbudding whatsoever, and one plant somewhat disbudded, in order that the quality of the blooms on the undisbudded stems may be compared with those on the disbudded stems.

34. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

DOUGLAS' JOURNAL.

At the request of the U.S.A. Department of Agriculture the Society has quite recently published the Diary kept by David Douglas nearly a hundred years ago of his exploration of the wildest parts of North and North-Western America, whither the Society had sent him chiefly with a view to the introduction of new plants. It will be found to be vastly interesting, not only on account of the extraordinary number of the plants he discovered, but also on account of the topographical notes it contains and the evidence it affords of the condition of the country and of the Indians a hundred years ago. It is published by Messrs. Wesley & Son, Essex Street, Strand, London. Price £1 1s.

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